The BUNGALOW BOOK

CHARLES E. WHITE, JR.

THE BUNGALOW BOOK

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THE BUNGALOW BOOK

BY

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DRAWINGS BY THE AUTHOR

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DEDICATION

To one who helps and helps and helps; ofttimes unthanked but never unappreciated.

Also, to Roger Burnham White, the Author's little wide-awake, freckle-faced pal.

PREFACE

Shortly after "Successful Houses and How to Build Them" was published, requests began to come from readers to the Author for a book specializing on the planning and construction of bungalows.

At various times during his career as an Architect similar requests have been made by clients, and readers who have noticed some of his contributions to magazines have written from time to time asking the Author to recommend a bungalow book that was authoritative but not too technical. Having looked in vain for such a book he decided to write one. Thus was "The Bungalow Book" evolved.

This is not merely a book of plans nor is it a learned dissertation on construction or supervision. The aim has been to offer to average readers a little book which covers in a manner all that amateurs need to know about the planning and building of bungalows.

The Author is grateful to the many readers of "Successful Houses and How to Build Them." He prays that they will condescend to also read "The Bungalow Book";—they, their friends and their friends' friends in increasing numbers (bless them); he hopes that though they may derive no benefit from this reading, it will, at any rate, do them no harm.

The Author makes gracious acknowledgment to "The Ladies' Home Journal," "Country Life in America," "House Beautiful," "The Ladies' World" (and other publications to which he has contributed from time to time) for architectural ideas used in this book, first exploited by the Author in these magazines.

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CHAPTER 1

THE BUNGALOW: HISTORICALLY AND INTRINSICALLY

ALL that glisters is not gold, wrote Shakespeare, and the same thought applied to domestic architecture suggests the slogan *all that bungles is not bungalow.* The term "bungalow" is a misnomer when applied to many American homes. To the average householder the term suggests a low, single-story dwelling with or without a second floor. In the minds of Americans it conjures up visions of a squatty building hugging hillside or meadow, with windows divided into little panes, verandas or porches extending along one or more sides and a low, overhanging roof in the shelter of which trellises climb from the ground, covered with creeping vines. A pergola extends outwardly from a diminutive white doorway spanning a brick terrace or irregular shaped stone flagging; little children run gayly about in the garden picking bright flowers with which the sunny rooms are to be festooned.

This is an almost complete departure from the derivative meaning of the term "bungalow" as found in India.

In America, the word "bungalow" is hard-worked, vacillating, meaningless but it has become so firmly rooted in American minds that the term is now practically sanctioned by good usage. Our worthy fellow citizens in the United States are quick to seize upon foreign words and phrases

and "bungalow" heads the procession, while "chaise-longue," "porte-cochere," "chateau," and the like proudly march in the ranks—terms used daily by glib tongues controlled by minds quick to grasp and loath to give up new ideas, however inconsistent they may be.

Americans are great followers of fads. When the sleeping porch was first invented its merits spread country-wide and no house was complete without one. This fancy was followed quickly by others in a time when, through the medium of popular magazines, the planning and furnishing of homes occupied a prominent place in the public eye; soon we had the "pantry-less" kitchen, the "wardrobe closet," the "living room," and the "sun room" to add to our list of fads. What were at first whims have now come to be incorporated in domestic architecture as component parts of modern life. Having proved fitting for the peculiar conditions of American life and having been found to contribute to the comfort of householders who are fortunate enough to have homes built along the more modern lines the fads have become facts.

The bungalow was accepted in America as an ideal. Beginning in a small way it gathered impetus to itself and quickly swept the country. For several years now the bungalow has held a high place in the esteem of the public. It seems that these little dwellings have come to stay and one may safely say now that the bungalow of the early days has developed into a really sensible type of domestic architecture, suitable to American living conditions and entirely desirable from the standpoint of architectural design, family comfort, and structural endurance.

It is true the bungalow comes to us from India where the bungalow type is accepted as normal, but the Indian bungalow is a quite different type from the American.

In India the term is applied to suburban villas as evidenced principally by the country inns or caravansaries

scattered through the country side, a few miles apart, for the convenience of travelers.

These buildings are usually long and low with high-peaked roofs unpierced by gables or dormers. The rooms are on the ground floor, only, and the entire space up under the roof is devoted to an air space for purposes of insulation from the hot sun of the country. The floor plan is usually a quadrangle with rooms in suites of two, three, or four, and the distance from the ground to the first floor is but a step or two.

Bungalows of the wealthy in the cities of India are more pretentious and often reach large proportions. Owing to the great number of domestics in the retinue of the Indian of affairs, there are frequently many rooms surrounding an open court. Troops are housed in military bungalows with chief characteristics much like family bungalows.

In India the roofs of bungalows are usually thatched or tiled, and in every building the necessity for shelter from the hot sun is made paramount in the design. Verandas usually extend around three or four sides of the building, shading the windows within from the direct rays of the sun.

In this country the appeal that the single-story building makes as a home, curiously enough, was felt in domestic architecture long before the so-called "bungalow" came into its own. Far back in Revolutionary times there arrived in the new world with their families, settlers many of whom built little dwellings of a single story which proved admirable for the small family.

In the first days of the one-story house it was probably reasons of economy that dictated the single-story plan rather than any idea of convenience or charm. A low, one-story structure cost less to build, was more quickly erected, and could be made to do for the family whose members were not too numerous. Later, when the householder's industry provided more funds, a larger house could be built, but in the

meantime one story was quite sufficient, being as much as many settlers could finance.

The history of the modern American bungalow, however, is quite a different story, present-day ideas being founded not on cost merely but on convenience, appearance, and comfort. So the modern bungalow is attractive to many regardless of cost; indeed, one might say with more or less authority that a bungalow costs *more* than any other type of home—that is, more per cubic foot of livable space.

The convenience of a bungalow in comparison with the convenience of an ordinary dwelling cannot always be estimated, because any good house design may be successful so far as convenience goes. Convenience, however, is truly a characteristic of the well arranged bungalow plan, because a sequence of rooms all on one floor has possibilities of greater convenience than groups on two or more floors.

This is not always strictly true as is indicated in many European houses (in some of which the rooms are all on a single floor) because European methods of keeping house are not as labor saving as American. It is a well known fact that in Europe waste steps and waste spaces are not so severely criticized as in America. Service is more easily obtained there and at much less cost. Even the mistress who does her own work in Europe has usually been poorly trained in labor saving, having been born and brought up in a home in which ease of housekeeping was far from practiced, understood, or even dreamed of. Consequently, for her the number of steps from one department of the home to another, or the convenience of having light and air in each room, or the desirability of labor-saving devices is not usually taken into account.

When, as is the case in so many European homes, the scullery is at the end of a long, dark passage, or one has to go outside the house to get coals for the kitchen fire, one does not always appreciate the advantage of a tiled bath-

room, an enameled kitchen range, or a modern built-in wardrobe. But in America the *convenience* of rooms all on one floor is well known and quite generally appreciated. The value of the elimination of stairs is generally understood by housewives who know from bitter experience what it means to travel up and down so many times a day. They know that rooms all on a single floor are easily reached with much less effort.

The modern American apartment has helped to call attention to the advantage of rooms all on one floor. Conditions in cities, where density of population dictates that many families shall be housed in a single apartment building, causes thousands of people to live in this manner. It has been discovered that apartments entail much less housework. Prospective house owners visiting their friends residing in flats are struck by their apparent comfort and the greater ease with which housework is done.

Unfortunately this tendency toward rooms on a single floor as arranged in the modern flat has given rise to a type of plan for bungalows which is not ideal, to say the least, for nothing could be worse so far as architectural charm goes than a bungalow arranged in the prevailing style of a flat building. The bungalow should be something more than this: something that indicates greater imagination than the ordinary flat-building layout with its living room in front, followed by dining room, bedrooms, kitchen, and bathroom, connected by the long corridor so often seen in an apartment.

A bungalow should be a home with all the charm and individuality of the approved house of two stories.

There is something cozy about a bungalow, inside as well as outside, and this most desirable quality makes an appeal to many who, having viewed with satisfaction the better class of bungalows feel a tug at their heartstrings and a desire to repeat the same type of building

for their own home. At the same time an architectural effect not attainable with any other type of building is made possible in the bungalow. Who can forego the charm of the low, broad roof line, the little front entrance with its quaint door opening so close to the ground, the low outlines of the little building which seems to nestle so snugly in its setting and offers so little competition with Nature as it rests modestly against the sky line, instead of rearing itself aggressively above the horizon.

The diminutive seems to appeal intensely to humans; the little bungalow attracts all eyes even the eyes of those who, with ample means to carry out their most cherished wishes, are yet attracted toward the sweet simplicity of the bungalow type, its freedom from pretense, and the artistic manner in which it fits the landscape.

The adaptation of the bungalow from Indian to American conditions has so changed its design that it is no longer recognizable, but the word "bungalow" has remained and will probably always exist as an architectural term applied to the low, single-story or story-and-half cottages with which we are familiar.

The increased cost of building in the United States as compared with India and the restricted size of building lots here brought about the first modification in the American style of bungalow. In the United States it is necessary for purposes of economy to build more compactly, so the first step was to utilize the space under the low roof for bedrooms instead of merely employing it as an unfinished attic. When bedrooms are located on the second story the number required on the first story are, of course, lessened and the size of the building is reduced by that much. At the same time, on a fairly wide building the peak of a sloping roof is quite high enough to house bedrooms without adding anything to the roof height. In other words, the space is already there, and can be used by merely

piercing the roof with dormer windows or gables to light and air the bedrooms at much less expense than if the bedrooms were built all on the ground floor.

Another innovation in the American bungalow is the arrangement of rooms in the American fashion, grouped about a central room, hall, or court. In India, bedrooms usually open from a long connecting corridor and for that reason Indian buildings are usually long and rambling. Under American conditions buildings are frequently more nearly in the form of a square or rectangle, a more economical type.

There are numerous advantages the bungalow has over other types of domestic architecture, advantages peculiar to the bungalow and not obtainable in other homes. As has been said, the first of these is the convenience of having most of the rooms on one floor. In bungalows containing one or more bedrooms on the second story this does not strictly apply, but in many buildings the owner's bedroom is on the ground floor with extra rooms on the second story, and without doubt it adds to comfort and reduces housekeepers' cares to have even one bedroom on the first floor.

Another architectural advantage of the bungalow is the possibility it offers in the way of charmingly picturesque design. A bungalow is low on the ground and for that reason does not attract the eye obtrusively. It can be made to "grow up out of the soil" more perfectly, perhaps, than can be done in a two-story building and this is always an advantage where the exigencies of good taste in design require that the building when completed shall look like part of the landscape—as though it had always existed there, not like a new and shining blot on the horizon.

It is a peculiarity of the bungalow that it may be used with equal success on the prairie lot, at the seashore, in the hills or on mountain sites. Thus it offers a wider range of possibilities than any other type of structure. The low,

horizontal, simple roof line partakes of the spirit of the prairie and composes pleasingly with it but on the hillside the effect is no less pleasant. When viewed from a lower elevation the underside of the overhanging roof of a bungalow produces a picturesque effect quite in harmony with rugged surroundings. At the same time the bungalow type of plan may be made as "rambling" as is necessary in any landscape, with great facility. On a hillside the different rooms can be stepped up on varying levels by means of terraces and still preserve the bungalow spirit.

A very good plan especially adaptable to the bungalow is the "patio" type consisting of rooms arranged around three sides of a hollow square. This is a charming arrangement and, alone, makes the bungalow a valuable contribution to the fine arts and justifies its existence as an individual style of domestic architecture.

Strangely enough, less expensive materials can be used in a bungalow than in other types without offending the æsthetics. Somehow people view bungalows as rather "rough-and-ready" and they will tolerate and even admire rough-boarded exteriors, stained or unstained, when in larger two-story dwellings the same construction would be dubbed "cheap." A rougher grade of brickwork, stonework, or cement seems to find its place consistently in the bungalow. Indeed, often rough work of this sort is more desirable than the more perfect workmanship required in more pretentious structures. Many designers have created reputations for themselves by the treatment of bungalows in this rough, artistic way using materials of less expense and applying them in a free and less laborious manner.

Among other advantages which may be mentioned in favor of the bungalow are the lesser thicknesses of walls required in a single-story building of brick, stone, or other masonry material. The distance from ground to roof is so much less in a one-story bungalow that masonry walls can

be reduced to the minimum without impairing the stability of the structure. Then, with a bungalow arrangement of rooms longer vistas from room to room are possible and that delightfully architectural and decorative effect secured by glimpses through doorways from one room to another is increased by the bungalow plan, which is usually so much more extensive on the ground floor than in the ordinary two-story dwelling.

CHAPTER 2

PLANNING THE BUNGALOW

MANY people get the wrong idea of bungalow plans, believing, innocently, that any single-story arrangement of rooms constitutes a bungalow. This is entirely an erroneous opinion. Merely a sequence of rooms arranged on one floor does not produce a bungalow, at least, not in the highest conception of the term "bungalow."

The plan that is the least successful and yet, unfortunately, the plan that has proven most popular is what might be known as a one-story flat building. This type of plan originated in cities where building lots are frequently as narrow as twenty or twenty-five feet, necessitating a long narrow building with merely a "front" next to the street. Face brick is often used in these little buildings on the street façade, with common brick at the sides and rear, and the entire lay-out of rooms merely follows the scheme in the average flat building. That is, a living room is in front, followed by a dining room and kitchen, the latter connected with the former by means of a long, narrow interior hall, from which the bedrooms and bathroom open.

You will find thousands of these buildings standing, not only in cities but in suburban towns, householders in the smaller places having seen and copied plans and photographs of city buildings published in magazines, believing they represent correct types. They forget that in smaller towns and villages where land is cheaper and the necessity

for the narrow lot is not paramount an arrangement of rooms permitting much more freedom in design is possible. They have failed to live up to their opportunities and unfortunately these examples of poor bungalows have given the average person wrong ideas about bungalow planning.

It is possible to design a long, narrow bungalow for a site restricted as to width by ingeniously dove-tailing rooms together in an arrangement to get away from the flat-building type, but as a general proposition, to achieve a good bungalow design one should plan a wider building more nearly the shape of an ordinary dwelling.

Viewed from outside the general effect of a bungalow with a wide frontage is much more interesting and architecturally charming than one with a narrow front. Viewed from inside, the arrangement of rooms made possible by a wide-front bungalow is usually much more attractive than in a narrow building. The cost of a wide bungalow as compared with a narrow one has nothing to do with the case because the cost per square foot would be about the same.

A floor plan that produces a square building, or one nearly square, is shown in Figures 1 and 2. In this plan the front entrance is directly in the living room but many of these plans provide for an outside vestibule in place of the little porch shown.

From the living room one door opens into the kitchen and the other into the principal bedroom. There are two more bedrooms and a bathroom on the second story, up under the roof, but these rooms will prove reasonably cool in summer because each of them have windows on two or more sides, thus providing cross-ventilation.

A porch, veranda or sun room in bungalows of this type can be placed on the front, side or rear; in the plan illustrated a veranda is located on one side and opens directly from the living room. Such a porch is usually glazed with storm windows or permanent windows and when heated in

winter it often proves one of the most comfortable rooms in the house.

Another type of nearly square bungalow which is pos-

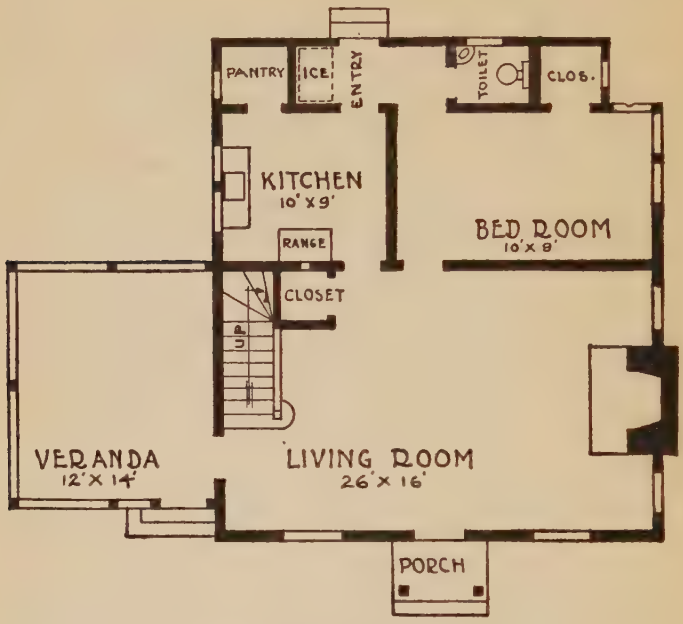

FIGURE I.
FIRST FLOOR PLAN.
CHARLES E. WHITE, JR., *Architect.*

sible when the building lot is not too narrow is illustrated in Figure 3, showing a one-story building with a living room, bedroom, dressing room, bathroom and combined kitchen and breakfast porch. The little kitchenette is separated from the small breakfast porch by means of two china

cupboards and this space is supposed to be sufficient for a family of two or three persons.

In addition to the bedroom a large dressing room with a portable bed or swinging door-bed can be included which

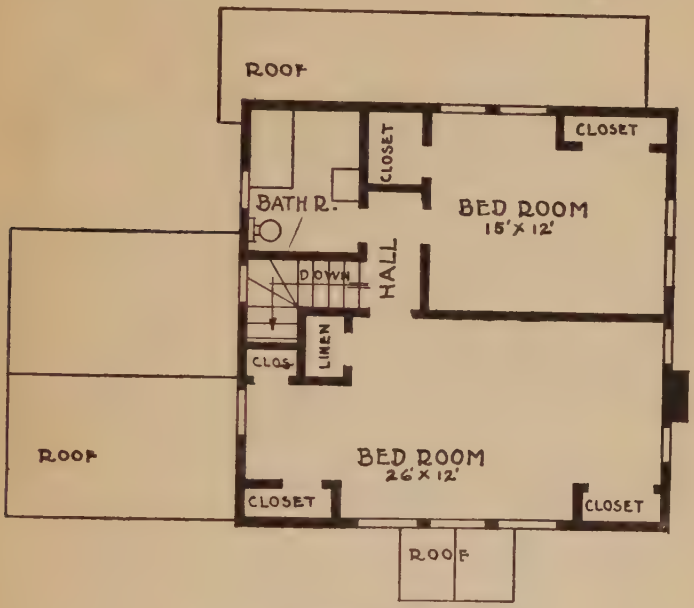

FIGURE II.
SECOND FLOOR PLAN.

will provide ample sleeping accommodations for one or two persons more. In other words, this little plan yields what is in effect two bedrooms, though one of the beds is made up and put away in the dressing room during the day.

For small families when the house mistress does her

own work this is an excellent little plan. More bedrooms can be provided upstairs when wanted.

For a wide lot where there is plenty of room to build a bungalow with a wide frontage the plan shown in Figure 4 can be recommended, with or without a vestibule at the front entrance. This arrangement of rooms produces a

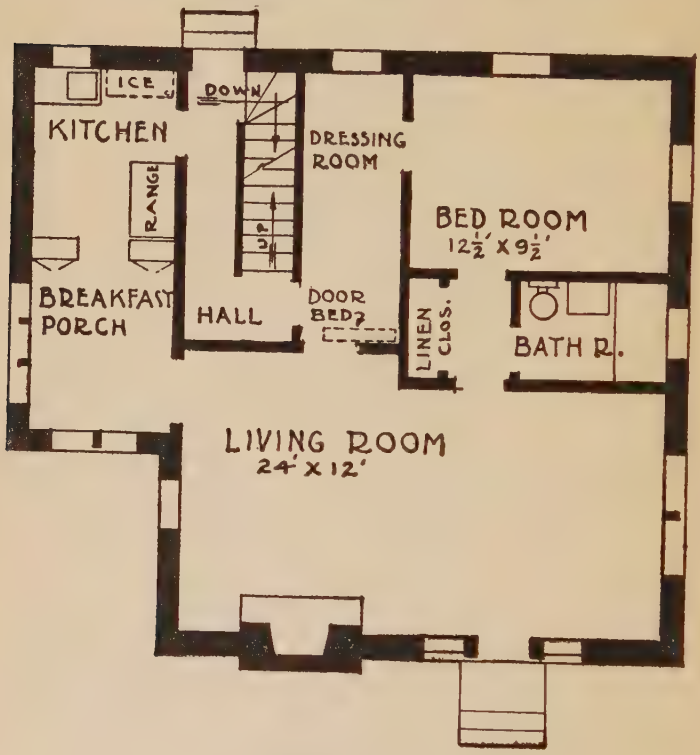

FIGURE III.
FLOOR PLAN.
CHARLES E. WHITE, JR., *Architect.*

living room, dining room, kitchen, breakfast porch, bathroom and two bedrooms and the building has but one story with no attic above.

For a narrower lot the same bungalow could be built with one end toward the street and the entrance at one side.

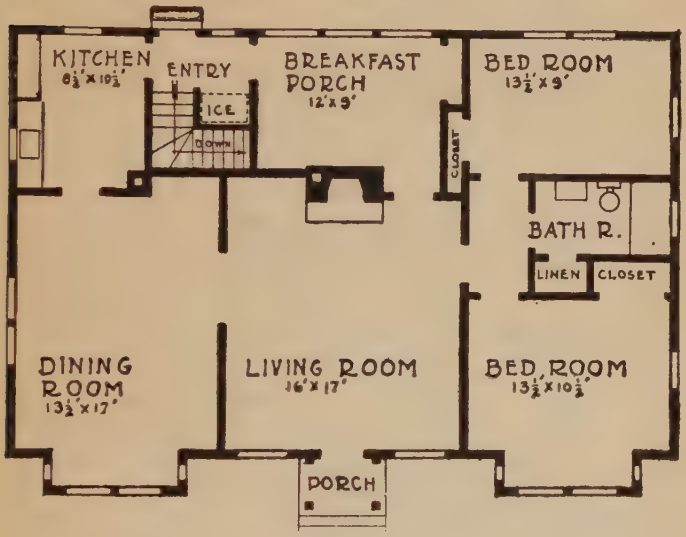

FIGURE IV.
FLOOR PLAN.

Figure 5 indicates a type of plan for a fairly large bungalow which can be placed on a lot of medium size. The main entrance, as you will see, is on the front at one corner and the kitchen entrance is at one side just back of the veranda. By taking a slice off the living room for a staircase this plan could be built with more bedrooms above.

A plan for a small, very cozy and practicable bungalow is shown in Figure 6, illustrating how small a bungalow may be without proving impracticable. This plan provides for a one-story building but another bed in addition to that in the bedroom is made possible by equipping the large closet with a portable bed for use at night in the living room. The little nook off the kitchen is to be used as a breakfast room.

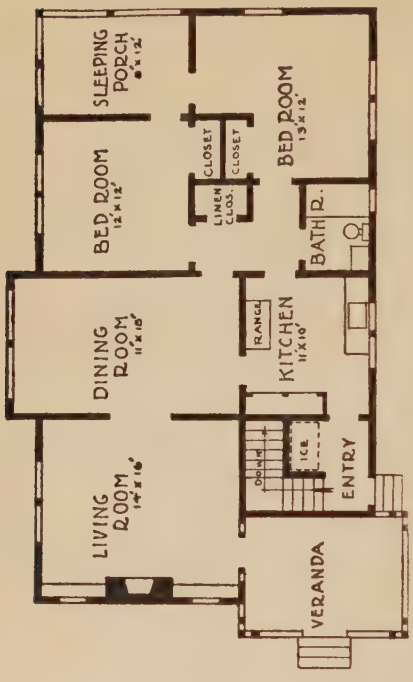

FIGURE V
FLOOR PLAN.

LONG, NARROW BUNGALOW WITH END TOWARD THE STREET.

For a more pretentious single-story bungalow the plan illustrated in Fig. 7 is shown. This plan when built broadside to the street requires a wide lot but if the sun porch end is placed toward the street, with the main entrance at the side, it can be built on a lot of moderate size.

A story-and-half bungalow of considerable size is illustrated in Figures 8 and 9, showing a building with a side entrance and vestibule opening into a hall. Across the front

of the building extends the living room, with a reception room and dining room opening from the opposite side.

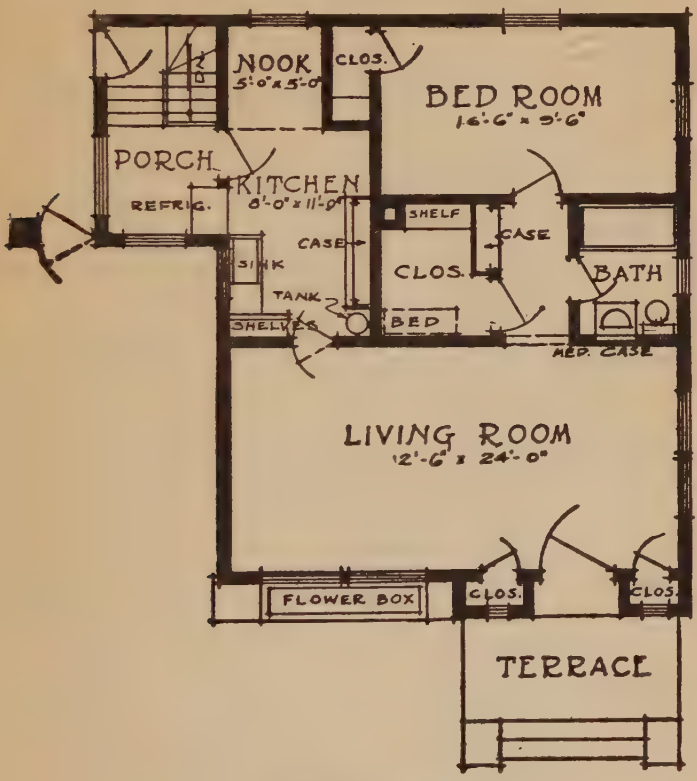

FIGURE VI.
FLOOR PLAN.
SINGLE-STORY BUNGALOW WITH EXTRA PORTABLE BED.

This bungalow also contains a breakfast porch, three bedrooms, bathroom and toilet room and no expense has been spared to make it livable and convenient in every respect.

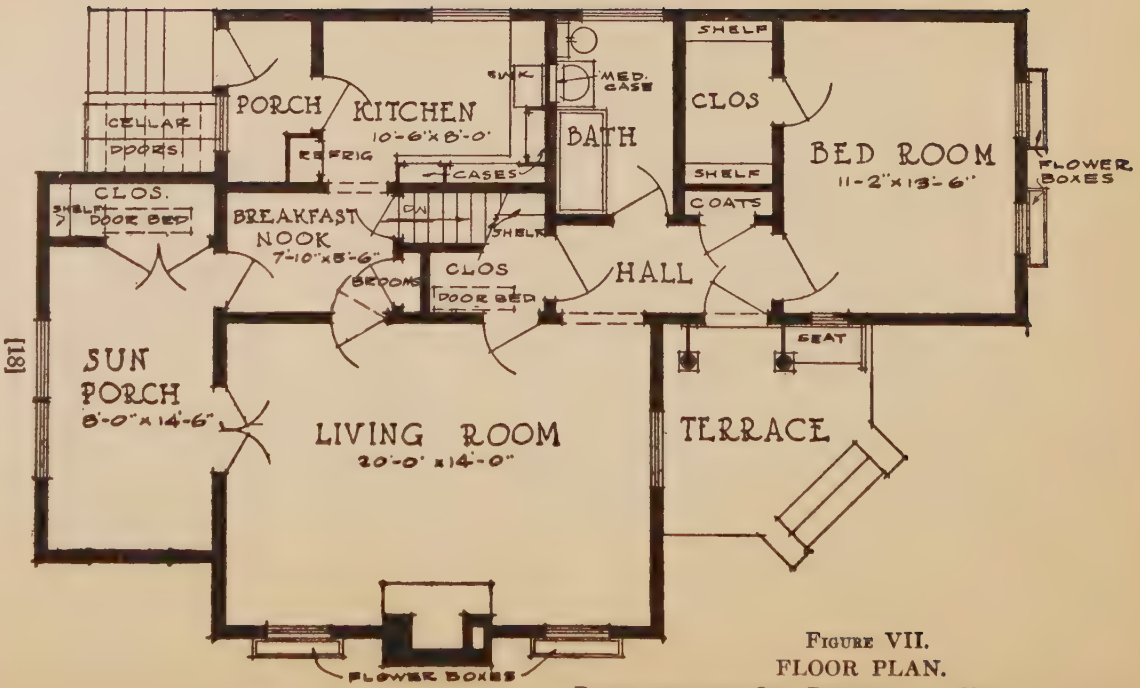

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FIGURE VII.
FLOOR PLAN.
BUNGALOW WITH ONE BED ROOM AND EXTRA DOOR-BED.

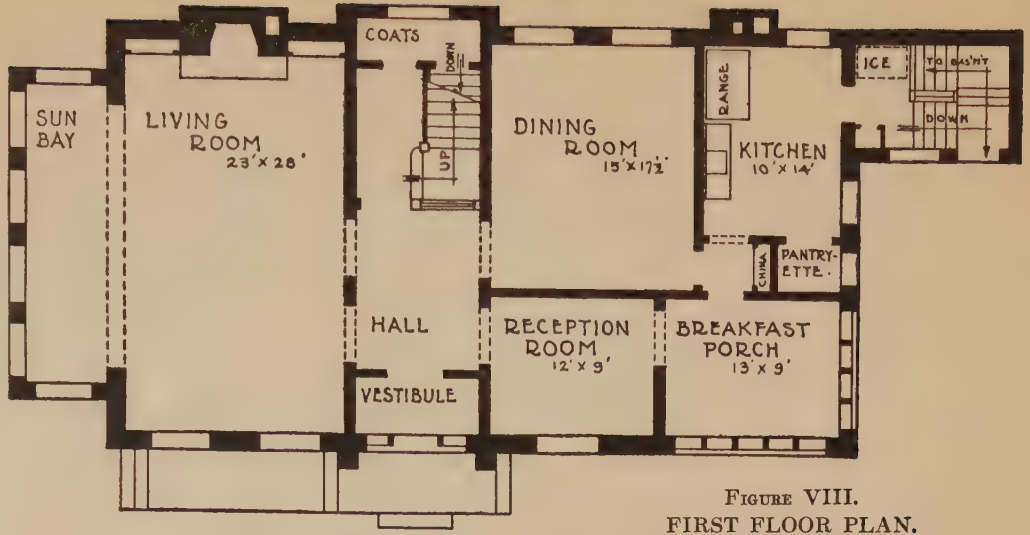


FIGURE VIII.
FIRST FLOOR PLAN.
CHARLES E. WHITE, JR., Architect.
LARGE STORY-AND-HALF BRICK BUNGALOW FOR A NARROW LOT.

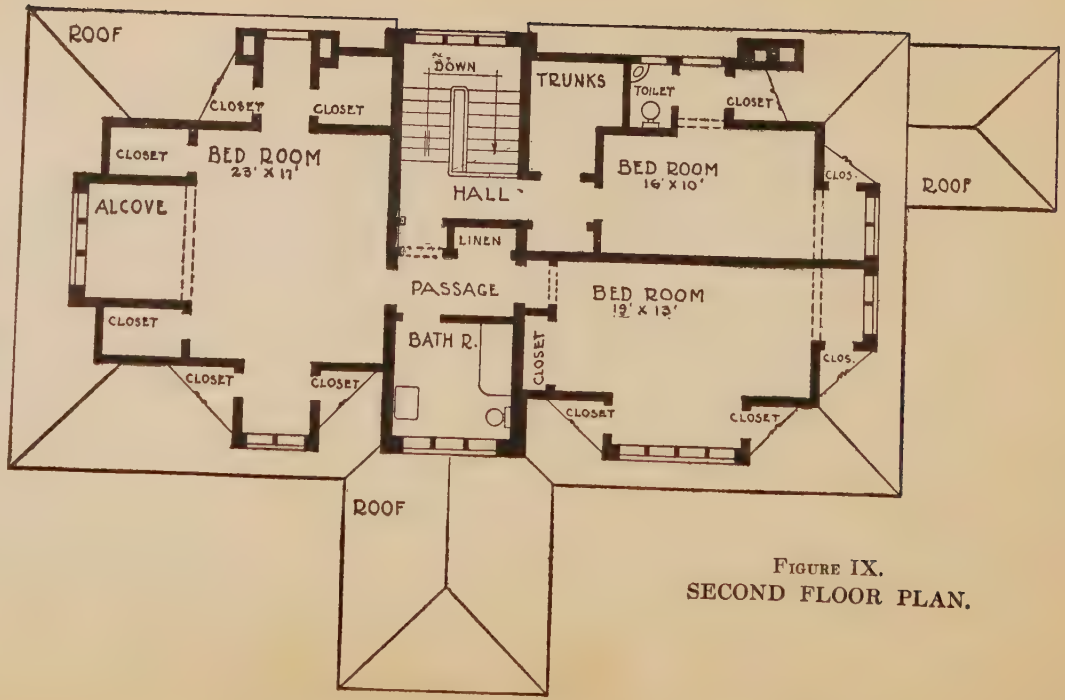


FIGURE IX.
SECOND FLOOR PLAN.

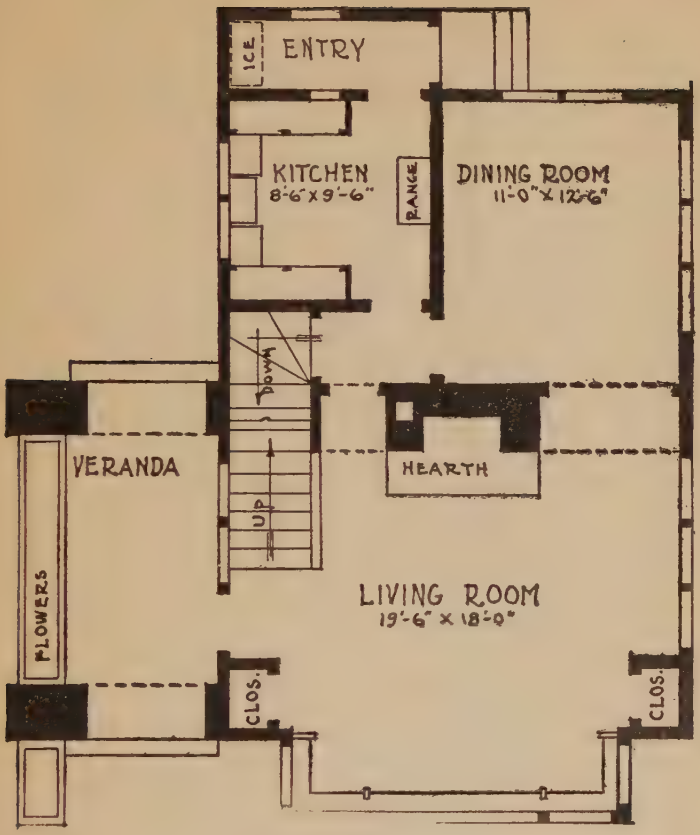


FIGURE X.
FIRST FLOOR PLAN.
A FRAME BUNGALOW FOR A SMALL FAMILY.

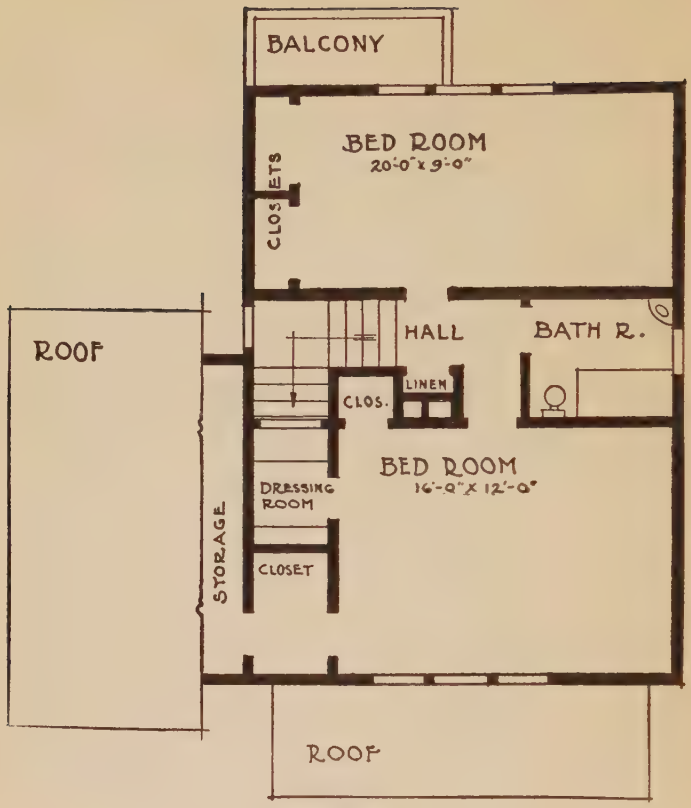


FIGURE XI.
SECOND FLOOR PLAN.

Figures 10 and 11 indicate a small, story-and-half bungalow containing a living room, dining room, kitchen, bathroom and two bedrooms.

The few plans illustrated in this chapter are intended merely to call the attention of the reader to the fact that even on small building lots bungalows can be built having just as charmingly individual plans as a two-story residence. To achieve this successful result it is merely necessary to forget many of the bungalows viewed in the past and confine oneself to a study of the individual problem, with a determination to produce something that will be architecturally worth while. A little imagniation is required in planning a bungalow, that's all; with skill employed in design we'll soon have a harvest of little buildings that will be as successful when judged from the standpoint of true art as the most pretentious of architectural compositions.

CHAPTER 3

THE FIREPROOF BUNGALOW

AMERICA has always been a lumber country. Early settlers found thousands of acres of forest which provided them with material for their houses and this condition has lasted until a comparatively recent date. It is not strange, then, that lumber has been the most economical and popular material for the building of houses. However, the time is approaching when wood must take a secondary place as a building material.

Office buildings first gave evidence of the necessity for a fire-resisting construction that would contribute to the safety of human lives and conservation of property. Unfortunately, it is not until there is a desire to save waste in material that there is usually a movement for better building construction. When dollars and cents become involved and investments rendered insecure by reason of inefficient building methods, experts are employed by commercial interests to work out new ideas which will eliminate fire hazard as much as possible.

Americans as a class hold human lives more cheaply, perhaps, than the citizens of any other land. We are all inoculated with an inborn indifference to hazard of life, not only of the lives of others but our own lives, for to give the American his due he is courageous to the point of foolhardiness when his own life is concerned.

Only a few years ago a movement was started along the line of Safety Engineering tending toward protection of

workmen in factories subjected to the hazard of moving mechanism, and this movement has at last involved the protection of citizens of every class; at their work, on the street, in railroad trains, trolley cars and now, at last in their homes. The foolhardiness of Americans is giving place to caution. The rush of hurrying feet slackens and the American mind contemplates; by propaganda Americans are gradually being brought to a point of view where they recognize the vital necessity of lessening accidents.

If fireproof construction is good for office buildings (in order to conserve lives, decrease risk, and enhance the value of an investment) it is good for the home, for there is every reason why a man's home should be as safe and as comfortable as his office. Families and furniture are more important than ledgers and files.

What can be more desirable than a fireproof bungalow? To know that one's home is safeguarded from disaster and to feel that one's family has this protection affords the utmost of satisfaction to the house owner who understands, also, that his investment is worth more in actual cash.

In discussing the fireproofing of a bungalow it should be understood that the term "fireproof" as generally practiced in house building is only approximately correct. An office building, for instance, is an example of more complete fireproofing than the average "fireproof" home. In an office building the frame is of steel or reinforced concrete, faced on the outside with brick, stone, or concrete (all imperishable materials). Interior partitions are of hollow tile, gypsum blocks, or similar non-burnable construction and exterior sash are made of steel, set in steel window frames and glazed with fireproof "wire-glass." Floors as well as walls are of masonry, though they are usually topped with ordinary wooden floor boards.

Thus, in an office building there is nothing to burn but the wood furniture within (and this is often of stamped

steel), the casings around doors and windows, and the doors themselves. Indeed, in many office buildings, doors and casings are also of stamped steel, non-burnable.

But in a fireproof home it is not the usual practice to fireproof to such an extent as in an office building. With fireproof walls for exterior and interior, and fireproof floors the average home is reasonably fire-safe. Of course, one might proceed farther and employ fireproof windows and doors and a fireproof roof, but the construction most commonly practiced in dwellings is to refrain from this greater cost because it has been found that most inwardly kindled fires in dwellings start in floors or partitions; with these vulnerable points improved, sufficient protection is achieved.

Outwardly kindled fires, that is, fires contributed by burning buildings adjoining, are fairly infrequent (except in a general conflagration), because of the distance between dwellings in the average American suburb, where it is the prevailing custom to build but one dwelling on each building lot, with open spaces between buildings. This is especially true of bungalows, which usually have a considerable fire-gap between structures.

Aside from the economic there are several reasons why fireproof and semi-fireproof buildings are growing in demand. Millions of dollars' worth of houses are burned up every year. A year's loss in this way would undoubtedly have paid for the fireproofing of those buildings in the first place. In addition to the desirability of fire resisting construction, the greater durability it affords is much to be desired. No matter how well it may be built, a frame building cannot resist the elements for so long a time as a masonry building.

The ideal bungalow, then, is at least semi-fireproof; that is, its main walls are fireproof. To go a step farther and add fireproof floors is even more desirable.

Many systems of fire retarding construction are in general

use today. Broadly speaking they are divided into two types: those composed of materials of clay and those composed of materials of concrete. All such systems incorporate more or less of a skeleton or reinforcement of steel.

Materials generally used for the exterior walls of fireproof bungalows are brick, stone, hollow tile, reinforced concrete, solid concrete, concrete blocks and cement plaster on metal lathing. For interior partitions hollow tile, gypsum blocks, manganese blocks, and plaster on metal lath are employed. Floors are usually of hollow tile and reinforced concrete, reinforced concrete alone, or stamped steel used in various combinations to produce a non-burning floor construction of masonry, with or without wooden floor boards for the upper surface.

Considering, first, the bungalow in which the exterior walls, interior partitions, and floors are fireproof, it will be found that such a construction is "fire retarding" rather than "fireproof." But this is an approved construction for any bungalow, and property owners in adopting this method of construction may be assured that they have reasonably safeguarded the lives of their families and the safety of their property.

In this construction the masonry walls of the foundations extend up to grade and then there are several methods of building the exterior walls.

First, let us consider a brick exterior consisting of one thickness of face brick on the outside backed up by an 8-inch layer of hollow tile on the inside. What are known as "back-up-tile" are frequently employed for this purpose, consisting of hollow tile (clay) building blocks, 8 x 8 x 12 inches, laid horizontally in mortar like any other masonry. It will be necessary to secure the face brick to the hollow tile backing by some system of bonding the former to the latter, and it will be found that a course of face brick comes

out about even with every other course of the hollow tile. That is, when two courses of hollow tile are laid faced with face brick, the latter will be found to coincide with the hollow tile so that at this point a row of brick headers can be laid in the wall, overlapping the hollow tile and built securely into the wall in this fashion. This ties the face brick to the tile backing, becoming an integral part of the wall and preventing the former from "peeling" away from the wall. Another method for securing face brick is by means of galvanized metal wall ties, laid in the joints.

Special tiles are carried in stock for window jambs, and when necessary a special stock system of concrete and tile lintels over window and door openings is easily utilized. In fact, tile units go together like building blocks used by children and require not much more mental effort in building.

For the exterior walls of a fireproof bungalow (when a cement-plastered outside surface is employed) grooved hollow tile laid vertically or horizontally are used, extending entirely through the wall. On the outside of this masonry wall cement plaster is applied (popularly known as "stucco"), the plaster adhering to the tile, not only by reason of the coherence between plaster and tile but also by means of grooves into which the plastic material flows and to which it keys.

In a building faced with Bedford stone, hollow tile back-up blocks may be used faced with 4-inch thick stone units, the stonework being bonded to the tile backing by means of stone headers or galvanized wall ties. Care should be maintained in all cases where a veneer of stone or brick is employed in this manner to bond the exterior surface to the interior backing, otherwise the wall would be weak and lack stability.

Hollow concrete blocks for exterior walls are treated like hollow tile blocks. That is, such a wall may consist of

concrete blocks the full size of the wall plastered on the exterior surface with cement-plaster, or, when it is desired

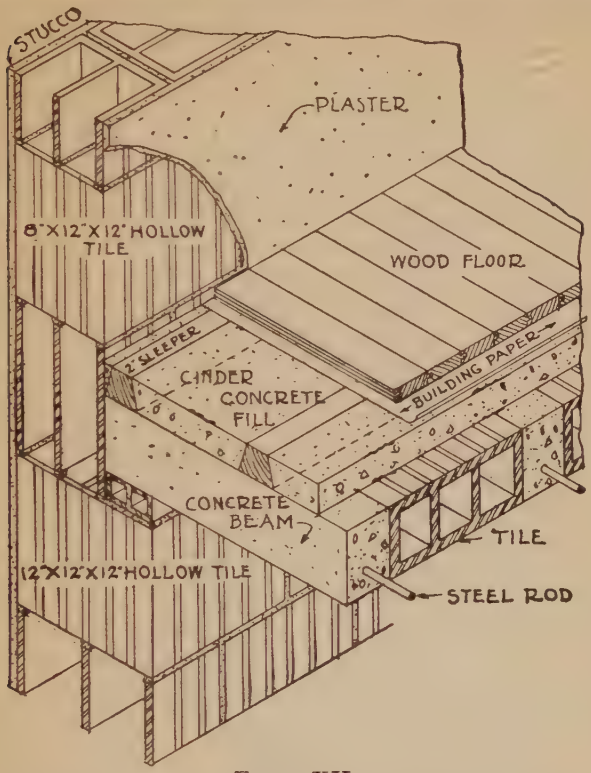


FIGURE XII.
METHOD OF CONSTRUCTING FIREPROOF FLOORS AND WALLS WITH HOLLOW TILE AND REINFORCED CONCRETE.

to have the blocks themselves appear on the outside, they may be left in their natural state producing a concrete block exterior finished surface.

To receive a plastered ("stucco") finish the blocks are made with rough, unfinished surfaces for a more perfect adherence of the plaster. When the blocks are to remain uncovered by other material, they can be finished smoothly, or a pleasing "granite" surface may be given them in manufacture by facing them with granite chips. Other stone finishes are possible by using chips of sandstone or similar materials. Another type of outside wall construction consists of steel studding with metal lathing and cement plaster, producing a "stucco" exterior.

When it comes to the interior walls of a fireproof bungalow one has the choice of hollow tile blocks, hollow concrete blocks, gypsum, manganese blocks, and steel studding. In each case plaster is applied to both sides of the partitions as in ordinary construction; that is, when concrete, tile, or manganese blocks are employed the plaster is usually applied directly to the masonry walls. When steel studding is used metal lathing finished with plaster is employed.

In interior partitions it is customary to frame door openings with 2″ x 4″ rough lumber. After the walls are plastered these are covered by the door casings and jambs. Before plastering, ordinary ¾-inch wood grounds are applied wherever wood trim is to be used. Plaster is applied as usual, except that the laths are omitted.

Interior partitions on the second story ought to be over those on the first story so far as possible, though floors may be designed to carry the weight of partitions at any point. In masonry, wall slots are left for the extension of heating and plumbing pipes by forming what are known as "chases" in the partitions when the walls are built. Of course, this makes it necessary to lay out the pipe stacks in advance of the walls so that the masons will know where the slots are needed. Another method is to put in the upright pipes in advance of the walls, and then build the

walls around the pipes, as is usually done in office buildings.

Masonry fireproof floors are usually of hollow tile units (separated by reinforced concrete beams) with reinforcement underneath the tile though floors composed entirely of reinforced concrete may be employed.

Ceilings are plastered directly on the underside of the floors, or they may be suspended on metal construction. On top of the fireproof floors 2-inch strips of wood are laid, about 12 inches apart, and to these strips the finished wooden floor boards are nailed. It is not necessary to have an under floor. Between the strips supporting the finished floor boards it is customary to lay cinder concrete, which holds the floor strips in place; building paper is laid under the finished floor.

Hollow tile floors are laid after building a temporary wooden platform or "form." On this platform the concrete beams are boxed and cast in place, then the reinforcing fabric, which generally resembles wire fencing, is laid, bedded in concrete. On this fabric the hollow tile units are laid with cement joints between. Nothing then remains but to apply the 2-inch wooden cleats, filled between with cinder concrete. After the masonry floor has completely hardened the forms are removed, whereupon, if properly built it is self-supporting.

Lintels over outside window and door openings may be composed of hollow tile combined with reinforced concrete. Rods of steel are used for reinforcement. Heating and plumbing pipes and electric wires extend up through hollow spaces in the tile partition (as has been explained), and from thence the horizontal gas pipes and other horizontal pipes are laid in the 2-inch space underneath the wooden floor.

A bungalow is considered to be sufficiently fireproof when walls and floors are of fireproof material. Some architects also design fireproof roofs but this is rather expensive

and is not common practice. Above the attic floor it is the usual custom to build with wooden rafters and employ ordinary boarding covered by slate, asbestos shingles, or roofing tile.

Floor construction consisting of steel joists spanning from wall to wall, plastered on the underside with metal lathing and plaster and topped with wooden floor boards, is also considered approved construction for a fireproof bungalow. Steel joists come in various sizes to carry the load safely and they are built into the building in much the same manner as ordinary wooden joists.

Safe loads for steel joists:

TABLE FOR STEEL JOISTS

SAFE LOADS FOR STEEL JOISTS

TOTAL SAFE UNIFORM LOADS IN POUNDS. LOADS CORRECTED SO THAT MAXIMUM DEFLECTION IS NOT MORE THAN 1/360 SPAN.

Span	4″	5″	6″	7″	8″	9″	10″	11″	12″
6	2311								
7	1981	2667							
8	1733	2333	3067						
9	1380	2074	2726	3793					
10	1118	1867	2453	3413					
11	922	1550	2230	3103					
12	773	1305	2045	2845	3733				
13		1113	1754	2626	3446	4348			
14		958	1511	2438	3200	4038			
15			1318	2135	2986	3769	4729	5973	7111
16			1159	1880	2800	3533	4433	5600	6666
17				1669	2500	3325	4172	5271	6275
18				1481	2225	3141	3940	4978	5926
19					2000	2844	3733	4716	5614
20					1800	2562	3546	4480	5333
21					1637	2322	3250	4267	5079
22						2120	2942	4073	4848
23						1937	2700	3752	4638
24							2475	3446	4445
25							2285	3181	4133
26							2115	2930	3820

Fire-retarding bungalows with fireproof walls cost about ten per cent more than the ordinary well built frame building with cement plastered exterior; thus a $4,500 frame bungalow can usually be built fire-retarding, for $5,000. This increased cost is well worth while.

In designing a fireproof bungalow one should consider the fireproof idea in the first conception of the scheme, if possible. The various units of the design should be simple. Plan to place the interior partitions of the second story as nearly over those below as is practicable in order to eliminate expensive supporting floor construction.

For semi-fireproof bungalows it is often the case that wooden floor beams are used instead of a fireproof floor. The ends of these beams are set in spaces between tile and the hole at the end of the beam is filled with mortar or concrete. Ordinary 2-inch thick joists may be used but 3-inch thick joists will, of course, be more fire-resisting, for in case of fire they will not char through as quickly as thinner beams.

CHAPTER 4

ORDINARY BUNGALOW MATERIALS: METHODS OF FRAME CONSTRUCTION

NOT all bungalow owners can afford the increased cost of fireproof methods of building no matter how desirable they may be, and for such as these it will be necessary to employ some manner of construction that will yield a good substantial building at less cost than fireproof construction.

First, the ordinary frame type will be considered; it will be found that in the bungalow the method varies but slightly from that employed in the ordinary two-story dwelling, except that the sizes of timbers may be a trifle smaller owing to the smaller size of the average bungalow as compared to an ordinary dwelling. It should be borne in mind that all dressed lumber is a little smaller than its market-quoted size. That is, take what are known as 2-inch x 4-inch studding for partitions; in most cases these timbers will be found actually to measure but $1\frac{3}{4}$ inches x $3\frac{3}{4}$ inches, and the same idea holds good throughout all other timber sizes. For this reason when estimating the safe load for 2-inch x 10-inch wooden floor joists, the scantiness of the timber must be taken into account as 2-inch x 10-inch pieces are really a trifle smaller all around and consequently will not carry a weight as heavy as if actually of full size.

As a matter of fact, the ordinary weights to be carried in a dwelling are very small compared with the loads sup-

ported in larger structures, so timbers of ordinary stock size are quite sufficient unless unusual conditions prevail.

TABLE OF SAFE LOADS FOR YELLOW PINE BEAMS

Total Safe Uniform Loads in Pounds. Loads Corrected so that Maximum Deflection Is Not More than 1/360 Span.

Depth	6″		8″		10″		12″	
Width	2″	3″	2″	3″	2″	3″	2″	3″
Span								
5 ft.	1491	2409						
6	1243	2008						
7	913	1475	1955	3158				
8	699	1129	1711	2764	2709	4376		
9	553	893	1351	2182	2426	3919	3550	5750
10	450	727	1094	1767	2183	3526	3200	5160
11	371	599	905	1462	1803	2913	2910	4700
12	310	501	761	1229	1518	2452	2650	4300
13			647	1045	1292	2087	2460	3960
14			559	903	1117	1804	2290	3670
15			488	788	972	1570	2140	3440
16			428	691	855	1381	1990	3210
17					757	1223	1870	3025
18					676	1092	1770	2860
19					606	976	1670	2700
20					546	882	1590	2575
21							1530	2450
22							1450	2350
23							1390	2250
24							1340	2150

The ordinary frame bungalow is built from the foundations upward of timbers, boarded on the outside with either tongue and grooved or square edge boards, and lathed and plastered on the inside.

The first horizontal timber (next to the foundation) upon which the timbers of the exterior walls stand is called the *sill*, and it usually consists of a large timber such as a 4-inch x 6-inch or 4-inch x 8-inch piece laid on the masonry

foundation wall; or frequently it consists of two or more 2-inch thick timbers spiked together to form what is practically a single, large sill.

The upright timbers of the exterior walls, consisting of 2-inch x 4-inch or 2-inch x 6-inch *studding*, stand upon this sill and are thoroughly spiked or framed to it. These *studs*, as they are called, are sawed to the right length before being raised in place so that when completed they extend in one piece from *sill* to *plate*, the latter being the timber which supports the *rafters* of the roof construction. Usually the *plate* consists of one or more 2-inch x 4-inch timbers laid horizontally across the ends of the upright *studs* and securely spiked thereto.

On this *plate* rests the *rafters*, thoroughly spiked in place, the latter being the sloping members of the roof construction to which the *roof boards* are applied; on the upper surface of the roof boards comes the finished roofing material, consisting of shingles, roll-roofing, slate, or tile, sometimes with an intermediate layer of waterproof roofing paper or felt depending upon the kind of material used for the finished roof.

As most foundation walls for bungalows extend merely around the outside of the basement, the latter is usually left open (without cross walls), and it becomes necessary to have some means of supporting the interior partitions of the building, which would be too heavy to find support upon the ordinary floor construction of the first floor.

For this means horizontal *girders* spanning from foundation wall to foundation wall are employed. These may consist of steel beams of sufficient size to require the least possible number of intermediate supporting basement piers or posts; or wooden *girders* may be used for the same purpose. In the latter case, since wooden girders will not safely carry as heavy a load as steel beams, it becomes necessary to have a greater number of intermediate piers or posts

to support the girders than are required with steel girders.

Interior partitions, consisting of 2-inch x 4-inch or 2-inch x 6-inch *studs* resting over, or nearly over the basement *girders*, extend up to the underside of the second-story or attic floor joists, the latter resting upon a *plate* spiked to the ends of the interior *studs*. Thus, interior partitions are framed in a manner similar to exterior partitions; this entire timber construction, consisting of vertical exterior and interior partitions together with the wooden *floor joists* and *rafters*, constitutes what is known as the *frame* of the building.

This *frame* should be sturdily constructed, its composing timbers well spiked together. Horizontal (or diagonal) pieces of timber between the studs and floor joists (called *bridging*) should be added to stiffen the supporting timbers; the entire framework of the building when properly built will have sufficient stability to prevent it from swaying in a heavy wind storm.

Floor joists, usually of 2-inch x 8-inch, 2-inch x 10-inch or 2-inch x 12-inch timbers span across from girder to girder (on the first floor) or from partition to partition on the second floor or attic. Of course, the size of timbers required for floor joists varies according to the distance they span and the amount of load they are to carry.

Sometimes, where the *floor joists* of the second story or attic come against exterior partitions, a special method of support is provided. Either a *girt* (consisting of a horizontal timber framed into the exterior walls for the support of the ends of the floor joists) is used; or a *riband* spiked to the sides of the exterior *studs* is employed for the same purpose.

The framework of a bungalow is the skeleton upon which depends the future life of the building. It should not be slighted in any way if one wishes to secure a structure that will endure through a long term of years.

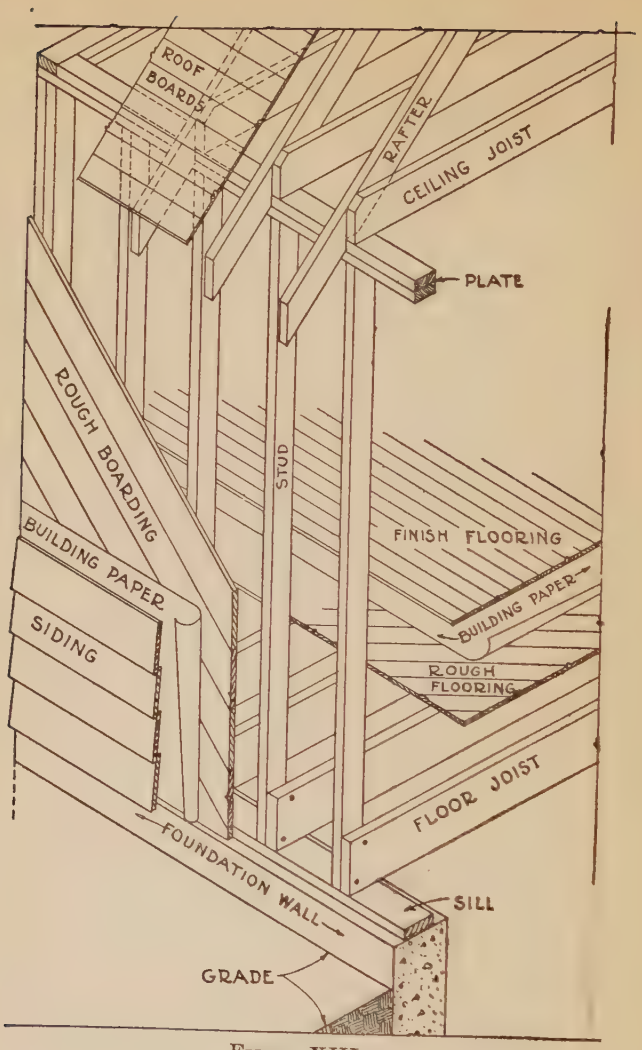


FIGURE XIII.
GOOD METHOD OF BUILDING FRAME BUNGALOWS

This framework is soon covered up by boards, lath-and-plaster, and other finishing materials and will not be obvious when the building is completed, but though invisible, if not well built the frame will be a source of constant trouble.

In a bungalow having a cheaply constructed frame, floors sag and every time the wind blows the building shakes. Upon walking across a room in which the floor joists are too light, the structure trembles. Vertical walls settle out of level and cause doors and windows to get out of plumb. The roof sways out of true, causing shingles or slate to buckle and cause leaks. Gutters lose their proper pitch, so that they no longer carry away the roof drainage properly; this permits roof water to drip over the sides and run down on the exterior walls of the structure, to ruin the paint or finished surface of the building.

Owners when building should insist that the framework of their structure be of over-sized timbers rather than undersized. The difference in cost of timbers slightly larger than the next smaller size is slight, but the difference in stability of the completed structure may mean very much to the home owner in the increased endurance of his home.

Lath-and-plaster or wall board is usually applied (inside) directly to the vertical *studs* of the exterior and interior partitions, and to the under side of the floor joists (ceilings). In some cases, however, *furring strips* are first nailed to the joists (for ceilings), lath-and-plaster or wall board then being applied to them.

There is some advantage in using *furring strips* as this method provides a more stable ceiling construction, and it is possible to ensure more fully plaster that will be level and true in horizontal planes. In most bungalows, however, laths are applied directly to the wall and ceiling timbers.

To complete the remainder of the floor construction, ordi-

nary floor boards (tongued-and-grooved or square-edged) are nailed on the upper edge of the floor joists, forming what is known as the *under floor* or *rough floor.* This rough surface of flooring is all the floor necessary during building operations. It should be of fairly good material, however, to stand the wear and tear of workmen and material for the period of construction. Before the finished floor is laid (usually, one of the last operations in the building) the *under floor* should be carefully gone over and repaired wherever necessary.

The *finished floor* of a bungalow may be nailed directly to the *under floor,* or *floor strips* may be first applied for the purpose. The former method is a little cheaper and is often employed in bungalows, but the latter method ensures better construction, because in this way an air space is left in which electric light conduits, gas pipes, and water pipes may be extended conveniently in any direction.

At the same time, since *floor strips* may be placed to run in any direction (lengthwise or crosswise of the rooms), this method makes it possible to have the boards of the *finished floor* run either lengthwise or crosswise. Of course, when the finished floor boards are applied directly to the under floor they can run only in one direction, that is, crosswise of the floor joists below, because it is necessary that the nails with which the finished floor is secured should extend down into the floor joists themselves. When *floor strips* are used, however, the finished floor boards are sufficiently secured when the nails extend firmly into the floor strips, the latter having been previously spiked securely to the floor joists.

Finished floors should never be laid until the *under floor* is covered with a good grade of building paper or felt, fitted tightly against the walls. Where each seam between widths of paper occurs, the latter should be well lapped

to ensure a tight layer of floor covering, the purpose of which is to prevent dust from coming through the finished floor, later, to burden the busy housekeeper.

An excellent and very desirable addition to any floor construction is what is known as *soundproofing*. Footsteps, noise of moving furniture, and voices from rooms above are readily transmitted to rooms below by the drum-like construction of ordinary floors. This can in a large measure be obviated by using *floor strips*, the spaces between which have been filled with mortar.

Floor strips are usually made of narrow stuff (1-inch thick x 2-inch or 2-inch thick x 2-inch) and *deafening*, as it is frequently called, often consists of ordinary mortar smeared in between strips for the total thickness. It is better to use 2-inch thick *floor strips* for this purpose, as *deafening* 2 inches in thickness is more soundproof than the thinner construction.

To do this work an advantageous bargain can usually be struck with the plastering contractor, who may use to advantage waste mortar drippings as far as they go, augmented by fresh mortar to fill out the space. The mortar should be left a little scant, not filled quite up to the level of the top of the floor strips so that when the finished floor is laid the boards can be driven tightly against the floor strips without difficulty. Lumps of mortar carelessly left extending above the floor level make it difficult to lay the finished floor boards properly.

When mortar deafening is used, the upper surface of the same should be covered with a good, durable grade of building paper or felt. Otherwise the mortar, when it has dried, may sift through the finished floor and produce a disagreeable and never ending amount of dust in the rooms.

Other measures for making floors and walls approximately soundproof consist in applying flax, seaweed, mag-

nesium, mineral wool, or similar material between floors and walls.

Many materials made for this purpose consist of fabrics or quilts containing fiber woven into sheets and sold in rolls. This is applied to walls and floors, usually between the timbers, and most of these methods are approved as practicable insulation against heat and cold as well as sound.

Wood lathing and plaster continues to be that most frequently employed for finishing the interior of bungalows, as it is usually the cheapest in first cost. Laths are usually 1½ inches wide and they should be what are known as *sound* and *well-seasoned*, the idea being to obtain laths which will not swell too much when damp mortar is applied (since there would be consequent shrinkage when the mortar dries out at completion). Undue shrinkage of this sort frequently causes cracks in the finished plaster.

Metal lathing instead of wood laths is better construction, but more costly; better because metal is unaffected by changes in temperature or humidity and because providing a firmer base for applying the plaster. At the same time metal-lath-and-plaster makes a more fire-resisting surface for the finished lining of a building.

On the interior of a bungalow it is very good practice to have wood laths on the side walls with metal lathing on the ceilings, since it is the ceilings which most frequently crack in later years. It is excellent to use metal lathing and plaster for the ceiling of the basement, not merely to keep basement dust from rising into living rooms above, but to form a fire-resisting barrier between the basement and the balance of the building. It has been demonstrated that metal lathing and plaster forms an effectual retardent to fire, though it cannot be said to be strictly fireproof.

Discussion of various methods of finishing the exterior of the bungalow follows in the next chapter.

CHAPTER 5

MORE METHODS OF CONSTRUCTION: EXTERIOR FINISH

WHAT are the more generally accepted methods for covering the exterior walls of a frame bungalow? In other words, what materials are best when the following points are considered:

Resistance to weather?
Endurance?
Economy?
Architectural appearance?

Comparative Cost of Exterior Materials.
(Arranged from least to most expensive)

1. Boards and battens.
2. Tongued and grooved siding.
3. Wide boards, lapped.
4. Clapboards.
5. Shingles.
6. Cement plaster.
7. Brick veneer.
8. Stone veneer.

Brick Veneer

Beginning, first, with *brick veneer* as applied to the frame bungalow (*brick veneer* on hollow tile and cement blocks having been covered in another chapter) it may be said

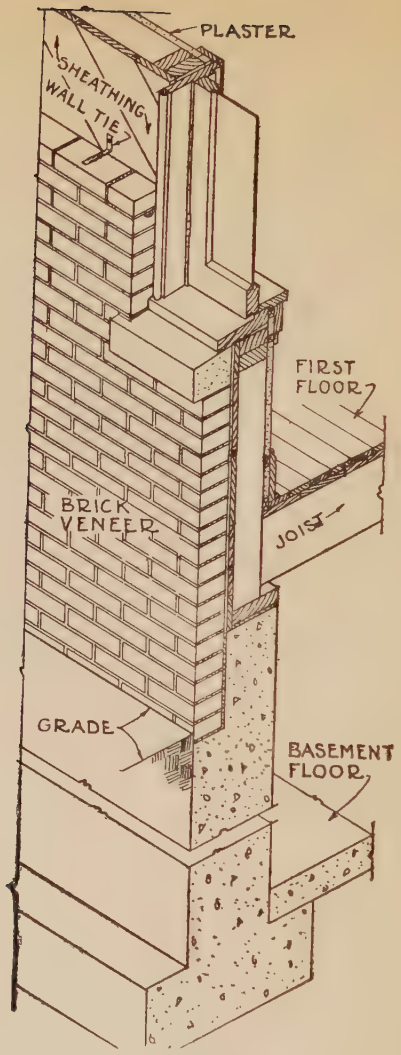


FIGURE XIV.
BRICK VENEER ON A FRAME BUNGALOW.

that this type of construction is deservedly popular with many home owners.

Brick veneer in this case consists of a layer of face brick on the exterior face of the building, laid up against the boarded wooden framework; the effect when completed is like an ordinary brick house. Solid brick or hollow tile brick-veneered houses are desirable when well built, but they are usually more expensive than frame houses. For the owner who must economize, brick-veneer-on-frame construction is suggested as offering some advantages, since it is frequently cheaper, though not always so.

It is claimed with some degree of truth that a frame house, brick-veneered, is warmer and drier than a solid brick house; at the same time it can be built more quickly.

It is in the application of the final exterior finish that a *brick veneer* house varies from an ordinary frame house. Instead of an exterior covering of wood shingles or siding, a layer of brickwork (a single brick thick, 4 inches) is built against the boarding, to which it is secured by metal ties. Before brickwork is started, the entire boarded surface of the house should be covered with a layer of heavy, waterproof paper held firmly against the boarding by means of laths. The purpose of this waterproof paper under the brickwork is to prevent moisture (which might permeate the brick-veneer in wet weather) from finding its way into the house.

A good job of *brick veneer* is as enduring as solid brick. In building houses of this character, however, one should remember that since there is only a single thickness of brickwork, all joints should be thoroughly filled with good cement mortar. A cheap job of brick veneer is bound to cause trouble later, for loosely applied mortar soon drops out of the joints and bricks are loosened until they finally drop out.

Cement Plaster

Another desirable exterior treatment for a bungalow (endurance having been considered) is *cement plaster*, or what is popularly known as "stucco." Many think that a cement-plastered house is built of masonry. In other words, they get the idea that by merely adding some plaster to a house of ordinary construction the result is a building as solid as though built of stone, tile, or brick.

Without doubt a frame house cement-plastered is nearly as durable as masonry so far as merely the external skin of the house goes, but it is unreasonable to expect that this form of construction can be as permanent as a building of masonry.

Exterior *cement plaster* is of natural grey or white, or it may be had in many soft tints. Strong color in cement-plaster is usually disagreeable, because less artistic in appearance than more delicate tones like cream, tan, grey, or rose.

When it comes to the financial side of the small house problem, *cement plaster* stands up well with any material that can be economically used in frame construction. In fact, when one estimates the cost of painting a wooden house every two or three years, *cement plaster* (which requires no paint) in the long run proves cheaper.

Cement plaster as most often employed consists of two or three coats of cement, sand, hair, lime, and crushed stone in varying amounts. *Three-coat* work, which is that most frequently employed, is put on something like this: the *first coat* is composed nearly or entirely of lime mortar, that is, lime and sand are mixed precisely like lime mortar used for brickwork, but sufficient cattle hair or fiber is added to the mixture to bind the mass when it hardens. This mortar, technically known as "plaster," is applied to the exterior lathing with a trowel. In this operation the

material should be spread with a firm pushing motion which causes the plaster to flow into the interstices between laths, so that when the plaster hardens it will cling tightly and not come off. Most plasterers put this first coat on rather roughly. After it has been in place a little while they "scratch" it over with a broom or coarse brush, to roughen it sufficiently so that the next coat will stick.

The *second coat* may consist of Portland cement and sand, with or without a small proportion of lime. This second coat is put on quite true and smooth, to make an even surface for the *third coat* more commonly known as "*rough cast.*" The latter consists of Portland cement, sand, and crushed stone or small pebbles such as might be screened from ordinary gravel. The mass is mixed with water (as, indeed, the previous coats are, also) and when it is the right consistency it is thrown forcefully against the sides of the building, forming a thin skin of rough texture plaster which adheres firmly to the plaster surface already applied. The effect of such plastering when completed is that well known rough texture, so pleasing to the eye and so durable.

In cement-plastered bungalows there are really several ways of finishing the last coat; these are, *rough-cast,* already described, *sand finish,* and *smooth finish. Sand finish* leaves a smoother surface than coarse rough cast, it being, in fact, grained slightly. This finish is produced by applying cement mixed with sand and water for the last coat (using no crushed stone or pebbles as in *rough-cast*). When the finishing coat has been applied it is allowed to harden slightly, after which the surface is scoured (usually by means of a wooden float). Rubbing or scouring the surface in this way produces the granular effect so pleasing to the eye.

When *smooth finish* is used for the last coat, cement and sand are applied smoothly with a steel float and the material

is worked something like inside plaster when smooth finish is used. As to the artistic advantages of one kind of finish over another there is no rule, it being entirely a matter of taste; plaster of a rough or medium texture, however, is usually preferred.

Rough-cast is probably the most durable of the cement finishes, since crushed stone or little pebbles mixed with cement and sand in the final coat produce a tough, weather-resisting coating for the outside of the building, usually considered more substantial than *smooth* or *sand finish.*

Contrary to statements of enthusiastic writers on cement construction, cement plaster is not cheap as to first cost. That is to say, a house plastered with cement cannot compete in cost with a house covered exteriorly with wooden siding or shingles. However, when one considers the cost of painting (first cost as well as future cost) cement plaster appears more reasonable. Take, for instance, a house covered with wooden siding that could be built for $4600. The same building might be constructed with a cement-plastered exterior for about $5000. Now it would probably cost approximately $150 to paint the house the first time and this operation would require to be repeated at least every three years, so it would not take many years to use up the difference in cost between painted siding and unpainted cement-plaster. As years went on the painted house would cost more for maintenance than the plastered house.

When *metal lathing* is used for a cement-plastered exterior, one should select a brand with small mesh and a large area of metal. This material should be delivered at the building either heavily galvanized or dipped in rust-resisting paint, for when metal lathing fails the failure is usually caused by rust.

One must remember that cement plaster is not waterproof. Rain frequently seeps through and attacks the metal of which lathing is made, unless the latter is protected by

paint. Small mesh is recommended for metal lathing, so that a maximum amount of metal may be contained in every square foot of the material.

If wooden laths are to be used, narrow laths should be employed (not over 1-inch) and they should be what are known as "half-seasoned"—that is, neither too dry, nor too wet. Most architects using wood laths prefer to have the laths nailed in place with at least five-eighths of an inch between each lath. Some plastering contractors dislike to apply wood laths in this manner, as it takes more plaster to fill wide spaces between laths than it would take for narrow spaces, and unfortunately, plastering contractors are often disinclined to use more plaster than is strictly necessary. Wide spaces are better than narrow ones, because they permit good, heavy bunches of plaster to flow in around the laths and clinch on the back.

Weather Boarding

Having considered brick-veneer on frame construction and cement-plaster on frame construction, it is well to examine, next, the various kinds of *weather-boarding* used on the ordinary frame bungalow when the exterior is to be finished with shingles, clapboards, weather boards, or other so called *siding*.

Shingles have always proved durable and architecturally attractive for dwellings of any kind, large or small, expensive or moderate in cost. Indeed, there seems to be no special type of bungalow for which they are not appropriate or in which their charm in design is not well pronounced.

Owing to the greater cost of labor in nailing on many small units such as shingles as compared with larger units, such as clapboards, shingles usually cost rather more than other kinds of wood siding.

Old-fashioned shingles were often made of white pine

and no wood is more durable for this purpose, but this material is now practically out of the market. Redwood, cedar, cypress, and lower grades of western and southern pine now prevail in most sections of the country. These are durable woods for this purpose and the shingles may be left untinted to weather as they will, or they may be stained with *shingle stain.* When stained, the pores of wood become filled with preservative which adds greatly to the life of the wood.

Shingles on walls last longer than shingles on a sloping roof, because the latter become more soaked with rain and snow and consequently rot more quickly. Shingles on side walls, especially when the eaves of the roof overhang and protect them, take in but very little moisture.

In applying shingles it pays to use only the best grade of galvanized or Swedish iron nails, since more shingles become loose from poor nails than from the rotting away of the wood. In other words, your walls and roof are only as durable as the nails which keep the shingles in place.

Clapboards are long, thin boards, similar in cross section to shingles. That is, from the thick butt at one edge they taper to a thin edge at the top. Various grades of pine, redwood, cedar, whitewood, and similar grades of "soft" wood are employed for clapboards (often called *siding*), and the material can be painted when smooth or stained when rough. Ordinary *siding* of 1-inch thick boards of "soft" wood is frequently employed with good results, architecturally as well as economically.

Another way to use these boards is to have them rift-sawed diagonally at the mill, each board making two pieces of siding (with one thick and one thin edge) having a tapering cross-section resembling clapboards. The cost of sawing the boards is usually more than offset by a saving in material, since two pieces are made from a single board.

Boards and battens make practicable siding and may be

applied vertically or horizontally. Vertical *boards and battens* are found in many old barns, the method consisting in nailing boards to the frame, vertically edge to edge, and then applying a strip of wood (batten) over the joints to keep out moisture. When boards are nailed on vertically, it is necessary to apply horizontal nailing pieces between the vertical *studs* to which the boards may be nailed.

A pleasing and less commonplace architectural effect is possible when boards and battens are applied horizontally, in which case no nailing strips are necessary as nails go through the horizontal boards into the vertical studs; *battens* are then applied horizontally to cover the joints.

When it is desired to get the utmost security from boards and battens, the edges of the boards are *grooved* to receive corresponding *tongues* milled on the edges of the battens, thus making a completely waterproof joint between the two.

Sidewalls of a bungalow may also be *slated* or covered with any of the customary roofing materials, such as *roll roofing* or *prepared roofing*. When roll roofing is used, however, it is usually necessary to provide finished (visible) wooden strips on the outside to cover the seams between widths and to help hold the material in place on the vertical walls. This method produces a sort of paneled effect.

Roofing Materials

No data on bungalows would be complete without some description of roofing materials and the methods of their application. The roof of a bungalow is frequently the weakest part of the structure and more consideration should be given to this part of the problem, perhaps, than to any other. A leaky roof or one which quickly wears out will be a source of continual annoyance and expense. The wise house owner will do well to spend a few more dollars here

and ensure greater durability and consequent freedom from roof troubles.

Wood shingles continue to be employed in expensive as well as inexpensive bungalows; they provide (in most sections of the country) a cheap and desirable kind of roof covering.

Asphalt shingles, frequently called *composition shingles,* are about the price of wood shingles though cheaper in some localities. They consist of layers of felt and fabric (with coatings of asphalt or other similar compounds between), the several thicknesses of which are pressed in manufacture into tough, flexible sheets of about the thickness of a book cover.

For those who prefer individual shingles the sheets are cut into shingle-units, or they may be had in units of two or more shingles. The material is also furnished in rolls and laid in the same manner as ordinary tarred felt. Material composing these rolls is called *ready-roofing* or *roll-roofing.*

Individual shingles cost a little more to lay than larger two, three, or five-shingle units, because they take more labor and nails in laying. These shingles, as well as many brands of *ready-roofing,* are usually coated on their upper, finished surface with ground slate, flint, or other stony material resembling finely pulverized stone. The most ordinary colors are grey, red, slate-blue, and slate-green, according to the natural color of the pulverized stone or slate used.

Owners should be cautioned to insist upon using the best grade of these roofing materials, only, unless they are willing to have discolored streaks, later, in the roof. Enough material should be purchased for the entire job at one time, as it is hard to match the color of one batch of shingles exactly with those from another batch. Manufacturers can guarantee that their material will be of uniform color

only when extra precautions are taken in the making, and when the material is carefully sorted and selected for uniform color. This care in making naturally increases the price for the more select material.

Giant shingles (asphalt or composition), are extra thick, more closely approximating the thickness of slate. They cost more, but manufacturers do not claim that they will last longer than shingles of regular thickness.

The best grade of galvanized iron nails should always be used in applying these shingles, the nails for this purpose being shorter and having larger heads than ordinary shingle nails.

Slate for roofs are split from the natural stone at the slate quarries. Thus the color of slate is the natural color of the material. It comes in red, blue, and green, and various combinations of these colors.

What is known as *red slate* is not a brilliant red but a dull, Indian red, about the shade of a child's building blocks.

Blue slate is really so dark it might almost be called black; it is this color which is used for blackboards in schools. Some of this slate is also more grey than blue in shade.

Green slate is of a faded sage green, and owners in specifying green slate should realize that the color will not be brilliant (like, for instance, green tile) as the latter is an artificial tint baked on the clay material and much more brilliant than can be obtained in quarrying natural green slate.

A very pleasing variegated appearance can be given the roof of a bungalow by mixing *blue slate* with *green slate,* not in regular patterns but hit-or-miss.

Good nails for slate roofs are as necessary as when other materials are used. Slate costs considerably more than wood or composition shingles, but the maximum durability

desired is not achievable unless first class nails are employed. Solid copper or copper-plated nails are best; next best are those made of galvanized iron.

The life of *wooden shingles* is increased when the roof boards are laid open; that is, when the boards are narrow and have a space of an inch or two between, such a method giving ample nailing surface for the shingles, but permitting air to reach the shingles underneath which prevents dry rot.

Slate should be laid on roof boards, close-laid, and under the slate there should be a good layer of *slater's felt* well lapped. In other words, with a slate roof (owing to the fact that the slate units do not fit quite so tightly as wooden or composition shingles), the roof underneath should be moisture proof. Slate will "sweat" and this is another reason for requiring a waterproof roof underneath the slate.

Asbestos shingles are excellent for roofs and the cost is usually about the same as, or slightly more than slate, according to the kind of shingles used. These are composed of fibrous asbestos and other minerals and compounds pressed into shingles. They are light, attractive, durable, and ordinarily are of various shades of grey, red, brown, and black.

A most pleasing effect is obtainable by using several shades of shingles on the same roof, judiciously mixing them so that they blend harmoniously. These shingles are about the thickness of slate (or a trifle less in thickness), and they should be nailed with the very best copper, or copper-plated nails.

Tile for roofs come in the ordinary flat *shingle tile,* in special *interlocking tile,* and various patterns of *Spanish tile.* This material is made of clay or shale and is baked in a fire like ordinary flower pots. The natural color of the baked material varies from a salmon pink to deep Indian red, according to the chemical composition of the

clay or shale beds which vary in different sections. Shades of green, blue, black, and other colors can be given artificially to roofing tile by glazing the same with colors.

A tile roof should have a complete waterproof felt roof underneath the tile, as the latter are often warped in the baking and moisture might work its way through the roof unless it is protected in this manner. Nails for tile roofing should also be of copper, or they should be copper-plated.

A necessary adjunct to the roof of any building whether bungalow or palace is what is known as *sheet metal work*—that is, the metal flashing, as well as the gutters and downspouts for carrying off the roof water. Cheap work at these vulnerable spots will offset and reduce the advantage gained by whatever care has been taken in providing an otherwise perfect roof.

Tin of the best brand can be recommended for lining wooden gutters, as tin will last a long time if the metal is painted underneath as well as on top with mineral paint (and then *kept* painted). The tin sheets should be small in size and each sheet should be well soldered to its neighbor, so as to produce a watertight strip of metal in its entirety.

For those bungalows which do not have *built-in* or *box* gutters, (that is, wooden gutters lined with metal) the ordinary galvanized iron *hanging gutters* can be recommended. Many architects believe *hanging gutters* are preferable to *box gutters,* because the former may be readily removed and renewed when out of repair without tearing up the roof. *Galvanized iron* is also frequently used for lining *box gutters* but many experts claim it is not best for this purpose, because the thick metal in long lengths has a tendency to expand and contract with changes in temperature causing it to split and produce leaks. Copper is excellent for lining box gutters or for building hanging gutters as this material does not corrode. *Zinc* and *sheet lead*

are also used for gutters, they being non-corrosive. Copper, zinc, and lead do not require painting for protection.

Valleys in the roof are lined with the same material as the gutters; that is, tin, galvanized iron, copper, zinc, or sheet lead may be used and the same rules apply as to gutters. By the term *valleys* is meant the interior angles of a roof. *Flashing* on a roof is also of the same material and no roof can be said to be enduring unless the *flashing* is well done, using good material, only. The term *flashing* means the strips of metal that extend up under the roof shingles, slate, or tile at the eaves, as well as strips against the chimneys and over the tops of doors and windows (as well as at the top of external moldings where protection from the weather may be required).

Down-spouts (sometimes called *conductors*) are made of copper, zinc, sheet lead, or galvanized iron, the first and the last mentioned materials being the most used in this country. Galvanized iron down-spouts should be corrugated—that is, instead of being smooth the surface of the metal should be wrinkled, permitting the ice which may form inside to expand with consequent expansion of the metal without injury. For the same reason it is well to have copper down-spouts corrugated also, though copper, being a softer metal than galvanized iron, has more tendency to expand without harm. *Square* down-spouts are more to be recommended than *round* ones, because they will be found to withstand the strain of ice better than the latter.

SINGLE-STORY BUNGALOW WITH AN L

Mr. Holmes, Architect.

SMALL STORY-AND-HALF BUNGALOW WITH SHINGLED SIDES.

CHAPTER 6

THE STORY-AND-HALF BUNGALOW

AS has been previously stated, the original bungalow as it exists in India is a building in which all the rooms are on one floor. This is an exceedingly practicable type for the hot climate of India, and Indian roofs are built to shelter house-holders as much as possible from the hot rays of the sun. It is a well known fact that habitations are more cool close to the ground than at a position even a few feet higher, and that is a reason for another of the characteristics of the bungalow on its native heath: living rooms are built so close to the ground that they are usually but one or two steps above it.

Never by any possibility would it be comfortable in India to place rooms on the second floor of a bungalow. No matter how many dormers might be added to light and ventilate the rooms under the roof, the severe climate in India renders it imperative that the roof space be used for protective purposes only—protection from extreme heat.

In this country, however, it is quite practicable to utilize valuable and expensive space under the roof by building in bedrooms, and though this method may offend the sensitive who insist that their little homes shall be truly "bungalows," the fashion has persisted until the term "bungalow" has been widely stretched by custom sometimes to include story-and-half buildings as well as single-story structures.

There are many good reasons for second story rooms. The roof is already there, usually at sufficient height above

the ceilings of the rooms on the first floor to permit another series of rooms above at very little increase in the cost of the building. With bedrooms and bathrooms on the second floor, the number of rooms required on the first story is reduced and the building can be restricted in size; this reduces the cost of the structure. This type of bungalow therefore costs less, room for room, than the single-story bungalow with its greater spread of foundation and roof.

In our more moderate climate, especially in the northern sections, second-story bedrooms can be made not only habitable but often as comfortable as those on the first floor. To accomplish this it is only necessary to bear in mind two or three important points.

First, one should appreciate the importance of *cross-ventilation* in any room, bedroom or living room on the first floor as well as on the second story. To get cross-ventilation there should be a window on each of two sides of the room, so that when these windows are opened a current of air will flow across the room, creating a draft that will tend to lower the temperature. When windows are on one side of a room only, air does not circulate so well and one does not get the maximum of comfort from summer breezes. Thus, considering the second-story bedrooms of a story-and-half bungalow, there should be a sufficient number of dormer windows to permit two windows in each room, at least one on each side.

Another way to make the rooms of the second story habitable, even when placed under a low roof, is to have a generous attic space in the peak of the roof above and *ventilate this space* to the outside air. One of the most common methods of accomplishing this is to insert what are known as "louvres" at each end of the building which permit air to circulate freely through the attic; thus the air in the space under the roof, heated to a high temperature

by the sun's rays on the roof, escapes through the louvre ventilators. In escaping it draws fresh air in from outside and a circulation is created which tends to reduce the temperature of the inner air. It has been demonstrated that circulated air (when this system of ventilation is used) lowers the temperature of rooms several degrees.

Louvres are merely slats (boards) inserted in an opening in the wall and overlapped in such a way as to keep out rain and snow, but to permit air to circulate freely. One may see examples of louvres in many old-fashioned barns, a favorite method being in such cases to build a "cupola" at the apex of the roof, with its sides enclosed by louvres for ventilating the barn.

You should understand, of course, that louvre ventilators which permit free circulation of warm air in summer will also permit circulation of cold air in winter, and this latter may not be desirable. Cold air will tend to chill rooms on the second story, thus requiring more heat to warm them. For this reason it is often practicable to have some method of closing the louvres in winter, either by shutters fastened on the inner side or by some system of movable louvres which may be opened or closed at will. A very good way to accomplish this is to rig up shutters operated by chains or cords (over pulleys) extending to a point on the second story from which place they may be operated. In this manner it is not necessary to climb to the attic space, as merely pulling the cord will open or close the ventilating openings above.

To keep birds out of the attic space, the louvre openings should be covered with galvanized wire netting of sufficiently small mesh to keep out the smaller birds.

Part of the battle against heat in second story rooms is won when the attic space is ventilated, but one can go beyond this point and make such rooms more comfortable by ventilating the upper rooms themselves into the ventilated

attic space, by inserting ventilators in the ceilings of the rooms. This can be readily accomplished by using ordinary registers or trap doors, operated by cords to be opened and closed at will. Of course, it follows that the ventilation of second story rooms into an attic space would be impossible unless the attic space itself is ventilated into the outside air. With no exterior ventilation, the still, hot air under the roof would enter rooms below and cause discomfort instead of contributing to comfort.

Another way of ventilating the dead air space in an attic is by means of the chimney; build an extra flue in each chimney for ventilation. Open the attic space into these flues by means of registers and it will be found that when the flues and registers are of sufficient size warm air is pulled out and a circulation is created.

Mechanical ventilators for cooling second story rooms may be used consisting of galvanized iron or copper ventilators, round or square in shape, placed in the roof above. By an ingenious method of baffling plates a circulation of air is created; larger ventilators of this type, of which there are many in the market, are commonly used in factories and other industrial buildings and most readers are familiar with them. They can be equipped with dampers to be opened or closed by means of cords or chains extending down to the story below.

Insulation of the roof itself is another possibility now receiving much attention from designers who find it desirable to obtain increased comfort for their clients. The same materials used for insulating floors and walls (as discussed in another chapter) are used for roofs and there is no doubt but that insulating materials will do much toward lowering the temperature in any building.

In considering the planning of second-story bedrooms it will be well to bear in mind that some of the most livable of bungalows are those containing bedrooms on two floors.

One may, of course, have all the bedrooms and bathrooms on the second story, retaining the first floor merely for the living rooms and kitchen, but the convenience of a bedroom or two on the first floor is so marked that owners have come to realize it. A master's bedroom on the first floor will be found very desirable, though bedrooms for the rest of the family and guests might be placed on the second story. Such an arrangement is ideal and many of the most successful bungalows are planned in this manner.

The disposition of the various rooms of the floor plan in a story-and-half bungalow should be determined only after due consideration of the building site. The width and depth of the lot, of course, have an influence on the size and shape of the bungalow. Many bungalows are built upon narrow lots, often as narrow as 30 feet, and for these one must choose an arrangement of rooms that will permit ample light and air at the sides.

An arrangement with a living room in front, followed by an entrance vestibule (for a side entrance) and corridor leading to the dining room, bedrooms, kitchen, and bathroom is often employed. The side entrance is not very good for a narrow lot, however, because it is so inconspicuous that it usually looks like a rear entrance. A much better plan for a narrow lot is to have the entrance directly into the living room in front. In this case the room can be protected from cold winds by means of a vestibule.

When the lot is sufficiently wide it is a good plan to build a bungalow with the broad side toward the street. In this type of plan the entrance can be in the center with rooms on both sides, or it may be placed on one corner. One very good arrangement has a porch in front, with the living room in the center of the building. One enters the living room directly from the porch. On the right-hand side is the dining room, with the kitchen and pantry behind it; on the opposite side is a bedroom, with the bathroom

and another bedroom behind. The rear of the living room opens into a little courtyard, for air and light.

For a bungalow having a narrow frontage you may have the living room on one corner and the dining room on the other. Behind these two rooms (which extend across the front) come the stairs for access to the half-story above. One bathroom, bedroom, sleeping porch, and kitchen are on the first floor in the rear, and two more bedrooms and a bathroom are upstairs.

CHAPTER 7

IDEAS FOR COMFORT FREQUENTLY OVERLOOKED

THERE are many little kinks in building methods gleaned by experts after years of experience in home building, which are of interest to the bungalow builder. Some of these little points are so simple they are hardly worth mentioning and yet it is these little things that assist so in making the bungalow, little or big, a success instead of a failure.

Warm Bungalows and Cool Ones

The general provision for making a building warm in winter also tends to shut out the heat of summer, so in building a bungalow with the idea of making it warm in cold weather one ensures the maximum of comfort in summer as well.

A warm house is often merely a matter of proper supervision during construction. Workmen, unless watched, carelessly leave open cracks around the building where the framework rests on its foundations; or, perhaps, windows and doors are not properly fitted, little gaps being left where cold may enter.

Build your dwelling approximately like a refrigerator if you would have it comfortable at all seasons. Insulate the walls and roof with some material that will keep cold out and keep warmth in. Watch carefully for cracks and gaps during construction, that they may be made tight. These

are simple rules anyone may follow and the result will be a lessened coal bill and increased comfort.

Stop the gap frequently existing under the wooden sill of a frame bungalow (where it rests on the foundation wall) by bedding the sill in mortar, and see that the building paper which is always used on the outside under the siding, cement-plaster, or brick veneer, fits tightly at window and door openings. This insulating skin of building paper is necessary for every frame building; none such can be wind-proof without it. The best papers for this purpose contain sizing, oil, tar, asphalt, or wax-like compounds. What is known as "*back-plastering*" secures another film of wind-resisting material that will be found well worth while. This operation consists merely in throwing a coat of plaster against the *inside* of the outside boarding. The plaster sticks and hardens, making a warm undercoat which effectually stops all cracks.

Wall and Roof Insulation

Similar to this method of back-plastering are many other ways for insulating the walls of a house with insulating quilt or paper. They are all based somewhat upon methods of insulation used in refrigerator building. Applied between the timbers of the outside walls and roof, insulating materials now made expressly for the purpose will do much toward eliminating cold. These are quilt-like materials coming in rolls like ordinary building paper, the substance being composed of felt, flax, seaweed, asbestos, or other well known fibers. The material is thick—often 5-16ths to ½ inch—and it is tacked in place between timbers to form a warm undercoat.

Instead of using building paper or felt for insulation, one may stuff the walls with ordinary mortar, asbestos cement, or mineral wool. In each case the idea is to make

walls as tight and cold-proof as possible by providing dead air spaces in the partitions.

Insulation against cold and heat also provides insulation against sound. As was explained in another chapter, partitions and floors can be made approximately sound-

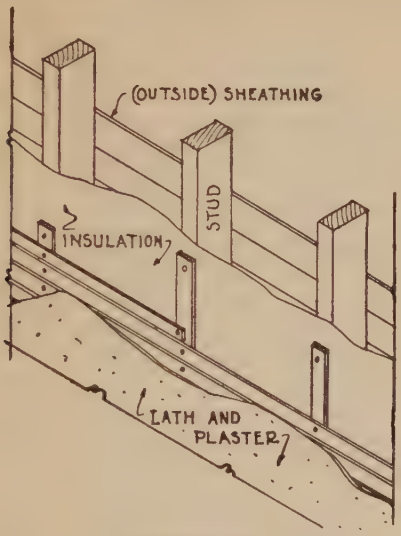


FIGURE XV.
CONSTRUCTION OF AN OUTSIDE PARTITION SHOWING INSULATION FOR WARMTH UNDER LATH AND PLASTER.

proof by the same methods that prevail in rendering them heat and cold-proof.

To stop gaps at windows and doors use metal weather-strips, a method now practicable for cheap as well as expensive houses. Many patterns are to be had for ordinary windows, casement windows, and outside doors, most styles being made of indestructible copper, bronze, or zinc.

Many bungalows are well built, but builders are careless about insulating the floors of bay windows where they hang out beyond the main walls. For instance, often there is a bay window in the second story projecting out beyond the wall below. The floor of such a bay is bound to be cold unless precautions are taken to make it warm, say, by filling in between the joists with cinders or mortar, and using several thicknesses of good building paper besides.

Extra Precautions for Comfort in Summer

Blinds (shutters) are useful as heat reducers in most climates. Doubtless, they help greatly to reduce the temperature of rooms in warm weather. Before the morning sun gets too high the blinds may be closed, not to be opened again until late afternoon. Blinds or shutters hung on hinges may be applied inside or outside a window. *Venetian blinds* (rolling inside) are also excellent for the purpose and very convenient to operate. To operate outside swinging blinds hardware may be procured permitting one to open them from inside a room by the turn of a little crank. For ensuring a cool bungalow, plan to have windows *on two sides of each room.* One window on each of two walls is much better than more windows on one side only, because of the cross-draft made possible.

In screening windows you should realize how much more efficient a window is opened *top and bottom* than one opened merely at the bottom. With the former method one is taking advantage of a well known principle of ventilation —warm air passes out at the top, while cooler air comes in at the bottom. For this reason it is better to have a screen cover the entire window than merely to screen the lower half. Full-length screens cost nearly twice as much, of course, but they are well worth the money in increased comfort.

Awnings will occur to most housekeepers as a practicable means of reducing temperature in rooms and making them more habitable in extremely hot weather. Many awnings are made detachable so that they can be hooked in place or detached without requiring the removing of even a screw. The chief value of awnings as a means of keeping rooms cool lies in the fact that they shut out sunlight but permit air to enter below. Awning blinds are good, too, arranged so they may be swung open at the sides like ordinary blinds, or hooked together and pushed out at the bottom to form an awning.

Very often second-story bedrooms are uncomfortable in hot weather because of the low roof above, and no means of ventilating the attic. This can often be corrected merely by putting in a ventilator to let out the warm air that accumulates when the hot sun strikes the roof. When building you should provide an extra ventilating flue in the chimney with a register in the roof space for ventilating the attic, as mentioned in another chapter.

Even a trap door in the roof, with another under it in the second-story ceiling is worth while. With both traps open warm air may pass upward and out, providing good circulation. The roof trap may be arranged with pulleys and cord to open and close from the second story (because, of course, it must be closed in stormy weather).

Window, Door, and Porch Screens

Except in some choice sections of the country, summer days bring summer pests—flies and mosquitoes. Porch and lawn are robbed of much of their power to please, and even the house itself is anything but a comfortable abode unless the wise owner has thoughtfully provided the right kind of screens.

Screens, exposed as they are to wind and weather—screens

which are pushed and pulled, jammed and knocked, receive probably the hardest wear of any fixtures in the house. Thus, screens are subject to rust, rot, and general disintegration; they should, therefore, be well made of most enduring materials and when put in service handled patiently and reasonably.

Rustless wire is best, for few house owners have time or patience repeatedly to paint and repair screens. The stoutest and best of frames should be provided with corners securely mortised; then may one expect that with reasonable care screens will last. Rustless wire may be had made of steel heavily galvanized; then there is copper, bronze, or white metal wire, the most durable of all screen wires. Many screens are now made with metal frames, a very satisfactory and permanent way to build them.

In spite of the increased knowledge of most house owners who have learned from experience the discomfort of a porch or veranda lacking screens, there are many, many porches still unscreened. No bungalow is truly comfortable unless the porch is screened.

For outside swinging casement windows there are screens which open inwardly, but by means of a clever window opening device the windows may be opened without opening the screens. For ordinary windows there are half-screens (protecting the lower sash, only) and whole screens which protect the entire window, permitting sash to be opened top or bottom (very much the better way).

Manufacturers have worked out modern screens very cleverly. Many screens are now made which may be applied without even a screw, little hooks and loose-joint hinges or buttons being used, instead.

A new kind of roller screen is now in the market made of bronze wire and equipped to roll up and down like a window shade. It operates on rollers fixed in the window jamb and can be drawn tightly in summer to keep out in-

sects and rolled up out of the way in winter. Some of these screens have the roller at the top of the window; others have the roller on or under the sill.

Sound Construction for Chimneys and Fireplaces

Here is another spot in the bungalow where it is wise to pay particular attention to construction. One reason why chimneys and fireplaces frequently fail is because they are so often neglected in supervision. Building superintendents should inspect chimneys, foot by foot as they go up, to see that every joint is properly chinked with mortar and all flues made tight in order to eliminate the fire hazard; they should examine carefully the distance between every timber near the chimney and flues, requiring proper air spaces between.

A custom which prevails in many towns is that of building a single flue chimney with but 4-inch walls; it is greatly to be condemned. Even when flues are conscientiously plastered with mortar inside from top to bottom, such construction is poor from the standpoint of fire risk, because plaster soon disintegrates permitting hot chimney gases to escape into the building through chinks in the brickwork.

It is better to build no chimney smaller than two flues, owing to the greater stability of a double-flue chimney stack. If but a single flue is needed build two flues just the same, using the extra one for a vent flue when there is no other use for it. Instead of plastering the inside of flues, use good, hard-burned terra cotta flue lining. Even in a cheap job it pays to build well in this manner, for the fire risk on a cheap job is proportionately as great as on a more expensive job. With a well built chimney having flues properly lined with flue lining, and in which no timbers in the building come in contact with any flues, a reasonably good job is ensured.

At the point where a chimney goes through the roof it is excellent practice to increase the thickness of the walls of the chimney from 4 inches to 8 inches, by corbeling out just under the roof. This method has two advantages: it gives the chimney a better architectural appearance and at the same time the thicker wall is enabled to withstand the ravages of time.

Although fire risk is not necessarily increased by a smoky fireplace, comfort is greatly threatened thereby. Unfortunately, many masons do not understand the theory of combustion in a fireplace, and for this reason many fireplaces built by them do not consume the fuel properly.

The throat from a fireplace should be long and narrow, as a stronger draft is created in this manner. Beyond the throat of the fireplace there should be an ample smoke chamber, leading into a good sized flue proceeding in as straight a line as possible to the top of the chimney. A small smoke chamber will not exhaust quickly enough and smoke will puff out into the room. When the flue is too small the same thing happens.

Rarely should a fireplace flue be less than 12 inches x 12 inches, and it is a good idea to have a flat shelf at the back of the upper part of the fireplace, so that wind blowing down the chimney will be diverted and not puff directly into the fireplace.

Chimney tops should extend at least 3 feet above a flat roof and 2 feet above the highest ridge on a peaked roof. There should be a cement chimney cap at the top, but the cap should be no smaller than the area of the flue.

The hearth in front of a fireplace should extend at least 20 inches into the room and it should be at least 2 feet wider than the fireplace opening. No wooden mantel should come closer to the fireplace than 8 inches at the side or 12 inches at the top.

At completion a chimney should be tested by building a smudge fire at the bottom of the flue. While smoke is flowing freely from the flue, close it tightly at the top. Then examine the sides of the chimney all the way up, to see if smoke escapes through cracks or other interstices.

CHAPTER 8

PLUMBING IN A MODERN BUNGALOW

THE principles of modern plumbing are not always appreciated by the average householder. It may not be necessary that he should understand the more scientific details, but he should realize the general characteristics of plumbing so that he may know enough about it to act intelligently. A few mistakes in running pipe or setting fixtures might prove costly, later. The expense of plumbing repairs mounts up quickly, so it is well to have the plumbing system put in right in the first place.

What constitutes a good job of plumbing?

How may one know that the piping is put in according to the rules of modern sanitation?

What kind of plumbing fixtures are best for a bungalow?

These are pertinent questions that interest the average person who aspires to have a home of his own and desires to get through this important experience with the least annoyance and worry.

The general principles of plumbing apply to dwellings large or small, mansions as well as bungalows. Broadly considered the plumbing system consists of a series of pipes and branches for drainage purposes and for taking away sewage from the building, and another series for supplying water, hot or cold, to the various fixtures. The former system of pipes requires an auxiliary line of air pipes open to the atmosphere.

The Plumbing Stack

To start at the beginning of the plumbing problem, familiarize yourself as much as possible with the general methods of piping as used in the most modern plumbing systems. In the first place there is the plumbing stack, a pipe usually 4 inches in diameter leading from the basement floor to the roof. From the foot of this stack a sloping pipe extends underneath the basement floor (or on the basement wall) through the foundation wall, where it connects with a line of tile pipe extending to the sewer. At the top of the plumbing stack a pipe passes up through the roof, where it is left open to the atmosphere.

Thus the stack is a complete line of pipe connected with the sewer at one end and open to the atmosphere at the other, in order that fresh air may circulate through it at all times. At various floor levels waste pipes from the usual fixtures are connected to this stack; on the first floor the kitchen and pantry sinks and first-floor lavatory, on the second floor fixtures from the second-floor bathrooms, and so on.

All piping composing the plumbing stack and its tributary inlets should be of "extra heavy" cast iron, and one section of pipe should be connected with its neighbor by means of melted lead poured into the spaces where the small end of one length of pipe (spigot) is inserted into the large end of another length (bell). At the completion of such a plumbing stack, it should be tested by plugging the open ends of the pipe and filling the entire system with water until it runs out of the top on the roof. Then the plumber is supposed to examine every inch of pipe for leaks readily indicated by the appearance of a trickle of water wherever a leak occurs.

A properly built plumbing stack will be so airtight that sewer gas cannot permeate the house after it is built. The

plumbing stack (several plumbing stacks may be necessary when there is more than one bathroom and they are widely separated) is usually built immediately after the rough framework of the house is completed, just as soon as the roof is on. Then, after it has been tested and leaks have been repaired, the building is ready for plastering. When the plaster has dried out thoroughly and the carpenters return to apply the interior trim, plumbers are ready to put in the plumbing fixtures consisting of sinks, washbowls, tubs, and water closets, branch pipes having been previously attached to the plumbing stack for this purpose.

After the sewage leaves the house, entering what is known as the *house sewer*, it must be drained into the *town* or *city sewer* system in the street. This is a comparatively simple proposition, merely consisting in connecting up the *house sewer* with the *street sewer* by means of tile pipe of sufficient size to carry off waste matter without danger of stoppage. See that this pipe is sufficiently large; from 4 inches to 6 inches is usually sufficient for a bungalow, and this connecting link between house and street sewers should be laid on a generous slope toward the street.

In different places practice varies as to details of connecting this house drainage system with the sewer. In many cities (especially in the west) drains connect directly with the sewer. In other places (notably, the east) a trap is interposed between drains and sewer. Whichever method is in operation in any town or city is, of course, the method to use. Indeed, most cities have plumbing ordinances which must be followed in this regard.

It is not only desirable but necessary for every part of the house sewer to have a sufficient number of *cleanouts* attached to the pipe to make it possible to clean out the pipes if they should become stopped, later. These *cleanouts* are cast iron fittings with tight iron covers which can be removed to permit long flexible rods of steel to be in-

serted by the plumber for cleaning out the pipes. To make this cleaning process easy pipes should run in lines as straight as possible so that the steel rods can readily thread the interior of the pipes. *Cleanouts* in the basement can be got at easily, but underground in the yard it may be necessary to build one or more little brick cleanout chambers with iron covers, of sufficient size to enable a workman to get down inside and reach the cleanout.

Septic Sewage Systems

For the country place having no municipal sewer special provision must be made. The old-fashioned cesspool is dangerous and a septic tank is the only scientific means of solving the sewage disposal problem. Septic tanks are easy to build, not too costly, and the results obtained by them are entirely satisfactory. The septic system of sewage disposal consists, briefly, of a concrete, brick, or metal chamber (not unlike a cesspool in appearance) to which sewage flows from the house. The heavier parts of the sewage sink to the bottom of this chamber, the lighter liquids flowing off from the top to be further treated and reduced to a harmless liquid discharging into the ground. In most such systems there are two chambers; the heavier portion of the sewage drops to the bottom of the first chamber where it is acted upon by septic action (an automatic bacteriological process which converts solids into liquids). The lighter liquid then enters a second chamber in which it is held for several hours (until the level of liquid rises to a certain height) when the liquid is automatically discharged (by means of a syphon) into drain pipes leading to the vitrification ducts.

Next, the sewage escaping from the tank flows through the drains to the nitrification beds, consisting of iron or tile pipe through which the liquid sewage comes in contact

with air. This is the last process required to convert sewage and make it harmless. Nitrifying beds are merely trenches about 8 to 24 inches deep in which iron or tile pipe is laid with open joints. Liquefied sewage from the septic tank escapes through the open joints of pipe into the coarse gravel or crushed stone bed surrounding the open drains, where air from the surface reaches it and the liquid becomes nitrified.

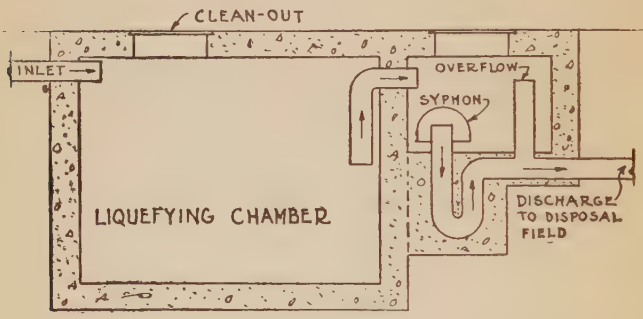


FIGURE XVI.
VERTICAL SECTION THROUGH A CONCRETE SEPTIC TANK.

Drains from the septic tank to the vitrification beds usually consist of several lines of pipe connected with the main drain from the tank by a valve. This valve can be turned to admit sewage to any section of the vitrification bed. Thus, a portion of the beds are in operation while the balance are at rest, allowing the latter to "recover."

Vitrification beds laid on a hillside are particularly efficient, but each section of pipe should be laid on a level and not on a slope, so that sewage will flow through slowly. On slightly sloping ground the pipes are dropped in level sections, each section containing several lengths of pipe.

Traps

Plumbing fixtures are never connected directly with the plumbing stack, for if they were nothing could prevent sewage odors from entering rooms by means of the waste pipes. In such a case, if the rubber plug was left out of a wash bowl or sink, sewer gas could enter through the strainer. This gas might not be so pronounced in odor as to be apparent, yet it would be there.

To prevent this difficulty a trap is inserted between each fixture and the soil pipe. Such traps are on the principal of loops of pipe holding water at all times. When the contents of a fixture are discharged (by pulling up the plug) waste water flows through the loop into the soil pipe. Sufficient water remains in the loop, however, to effectively interpose an effectual barrier between the open fixture and the soil pipe. These loops are called traps. They vary (as to type) for each fixture, those employed for kitchen sinks, for instance, being different from those used for bathtubs. In a water closet the trap is built into the china bowl of the fixture itself.

Kitchen sinks and laundry tubs do not usually discharge directly into the soil pipes. So much grease collects in kitchen and laundry drains it is considered better practice to discharge them into a catch basin, which in turn overflows into the tile drain running to the sewer. Thus grease, floating on top of the water, is deposited in the catch basin from which it can be periodically removed. Grease traps which intercept the grease before it enters the drains are also frequently used in connection with kitchen sinks and laundry tubs.

Arranging the Fixtures

In bungalow planning one must pay particular attention to the sizes of the plumbing fixtures to be used be-

cause, usually, one is more or less bound down by restricted space. Many mistakes are made in getting fixtures too large for the spaces they are to occupy; then, after they are installed, the bathroom is too crowded for comfort. A little attention here may save considerable annoyance later, for once installed, it is, of course, too late to change the fixtures.

When plans are made for the bungalow it is a good idea to cut out little paper patterns of the space the fixtures will occupy when installed. Sizes of your fixtures may be obtained from plumbing catalogs or your plumber can give you the desired information. The patterns should be made on the same scale as the house plans (usually, one-quarter of an inch equals one foot) and by laying these little pieces of paper down on the diagram of the bathrooms as indicated on the floor plans, one can try different arrangements and see just how they would appear in the completed building.

These paper models may be moved about on the plans and the spaces between them measured with a scale, indicating just how much room there is for the fixtures themselves and for aisles and standing spaces.

SIZES OF PLUMBING FIXTURES

(Approximate Standard Sizes)

Water Closet

Floor Space, 14″ x 19″, without tank.
Height, 18½″, without tank.
Tank, 22″ wide, 8½″ thick, 18″ high.
(tank is 38″ high from floor to top)

Bath Tub

Length, 4′ 6″, 5′, 5′ 6″, and 6′.
Width, 29″, 30″, and 33″.
Height, 17½″ to 24″.

Pedestal Lavatory

Oval—dimensions:
18″ x 27″, 19″ x 28″, 22″ x 33″, and 24″ x 33″.
Square—dimensions:
20″ x 24″, 22″ x 27″, and 22″ x 30″.

Wall Lavatory
18″ x 21″, 18″ x 24″, 20″ x 24″, and 22″ x 27″.
Corner Lavatory
15″ x 15″, 16″ x 16″, 19″ x 19″, and 20″ x 20″.
Kitchen Sink
Without Drainboard:
18″ x 30″, 20″ x 30″, 20″ x 36″, 20″ x 40″, 22″ x 36″, and 22″ x 42″.
With One Drainboard:
42½″ x 20¼″, 52½″ x 20¼″, 60½″ x 22¼″.
With Two Drainboards:
74½″ x 20¼″, and 78½″ x 22¼″.
Height (applies to all kitchen sinks):
30″ to 36″.
Laundry Tub
Two Sections:
53″ x 26″.
Three Sections:
83¼″ x 26″.
Combination Laundry Tub and Kitchen Sink
50″ x 25″.

Again, when the building is framed and the bathroom partitions are built (but before the first rough piping of the plumbing system is started), visit the building with your plumber and get him to draw out, full size on the floor with chalk, the exact shape of every plumbing fixture. Then you can walk about the chalked diagrams and assure yourself that there is plenty of good, workable space. If you find the room too cramped you may change your fixture order for smaller fixtures, with very little difficulty.

Selecting Fixtures

In selecting plumbing fixtures one instinctively gives most importance to the water closet. In choosing water closets the owner should demand that they be well made and that each fixture be connected to the soil pipe by means of a strong, metal, leakproof flange at the floor. Almost everyone has had experience with a leaky water closet; all will understand why it is better to have a metal floor connection than shortlived cement.

The next point to consider in selecting a closet is *silent operation.* In selecting plumbing fixtures the buyer should always have with him the floor plans of his house, for in no other way can he get fixtures of just the right size to fit the space. In bathrooms, the location of windows makes quite a difference in the arrangement of fixtures. Often in small bathrooms it is necessary to put the tub under a window, though this is not ideal.

Latest models of syphon jet water closets are usually to be preferred and any syphon closet may be recognized by the little hole at the bottom (sometimes concealed) through which a jet of water plays. It is this jet suddenly spurting when water is turned on that causes a strong suction upon the contents of the bowl, producing a quick, clean, noiseless action of the closet.

All latest types of water closets have the "low tank." Many of them are equipped with mahogany or white enamel seats. The best tanks are of vitreous ware instead of wood, being more durable than the latter.

One can choose an enameled iron bathtub or one made of porcelain. Latest types are known as *built-in* tubs. That is, they fit snugly against the tile walls of the bathroom and come down tight against the floor. These are sanitary besides being very fine in appearance. For those who prefer them there are other types of tubs standing free from the wall on legs or with a base set close on the floor.

Pedestal lavatories (wash bowls) have come to be the "last word" in plumbing perfection. They are usually made of enameled iron, vitreous ware, or porcelain. Many beautiful designs are carried in stock by all manufacturers; each pattern can be supplied with any of the various types of faucets. Other lavatories are hung to the wall on brackets or supported by enameled iron, porcelain, or metal legs.

Seat baths or foot baths are being installed more in

present-day bathrooms than formerly, for many have learned their convenience. They are especially desirable for bathing small children. Enameled iron and porcelain are chiefly employed for these baths.

Nine out of ten householders now require a shower bath in the new home, for women as well as men have come to appreciate the delights of a good shower. There are *tub-showers* (installed over a bathtub), *built-in showers* (placed in a niche in the wall), and *open showers* standing free in the bathroom over a receptor. The simplest type of tub showers are so inexpensive they are practicable for even the most modest bungalow, more elaborate built-in apparatus being worth considering for more pretentious homes. Duck or rubber curtains are used for most showers. Stalls for built-in showers can be obtained in marble, glass and tile.

Laundry Tubs

Soapstone laundry tubs are excellent for the purpose, though a newer and later yellow, white, or grey crockery ware is now in the market. Porcelain is also used for tubs. Best types of soapstone tubs are jointed in a leak-proof method and can be had in two-part and three-part patterns, standing on iron legs. Crockery tubs are of heavy ware similar to crockery kitchen utensils and come mounted on an iron frame holding two, three, or four tubs. Cast cement tubs and enameled iron tubs are also in the market. Least costly laundry tubs are made of cement; next in price comes enameled iron with soapstone, crockery, and porcelain following.

Pantry Sinks

Pantry sinks are usually of copper or German silver, because they are used almost exclusively for washing dishes and one is less liable to break dishes when a metal sink

is provided. German silver is the best metal since it does not require polishing. Most pantry sinks are made to order to fit the space as required.

Faucets

A constantly increasing annoyance in a plumbing job is occasioned by poor faucets. All faucets look alike to the average citizen building his first bungalow, and he is often influenced in favor of a particular type because it is cheapest. This is always unwise. Above all things choose only faucets of the best grade, for one must remember that these little instruments may be opened and closed dozens of times during the day and must, therefore, be conscientiously built to withstand wear. No one wants to be fussing with leaky, noisy faucets, yet that is what follows when cheap goods are used.

Faucets should be made of good, *thick* brass. Faucet mechanism should be simple in operation and so constructed as to prevent that snapping noise in pipes apt to occur when a poorly designed faucet is suddenly opened or closed. *Water hammer,* as it is called, can also be avoided when pipes are scientifically connected to faucets, as every plumber knows, by providing an air chamber in the system beyond each faucet.

Water Supply

The water supply system where it enters the house should have a shut-off, so the entire system can be turned off. From this point galvanized iron pipes extend to the various fixtures sloping up toward them, so that in the event the water is turned off it will all drain back to the point where it enters the basement from outside and leave the entire water piping system empty.

One branch of the cold water supply is extended to the hot water heating apparatus, usually consisting of a little

coal heater or a gas, electric, or oil heater, which warms the cold water and delivers it either directly to the hot water mains or into a storage tank from which it is delivered to the mains. Branches from the mains, of course, extend to the different fixtures.

The pipe extending from the water main in the street to the house should be of extra heavy lead (it is now conceded by experts) because a galvanized iron water supply pipe in the ground lasts but a few years and must then be dug up and renewed.

Rural Water Supply

If there is no municipal water works (as in rural districts) the bungalow owner must provide his own source of water and this usually means a well, though some are fortunate enough to find springs on their property, or in mountainous sections water may be piped down from the heights above. Once the well is driven (which, by the way, should be only after much thought has been given as to its best location), comes the question of how to force water from the well to the house. The well should be located far enough from the house, stable, or garage to prevent undesirable surface drainage finding its way to it. When the right kind of sewage disposal system is used this distance can be comparatively short, for with sewage properly taken care of all danger of contamination of the water supply is eliminated.

In many cases windmills continue to be used for pumping water and under favorable conditions there is no better cheap way of getting a water supply. The first cost of a windmill is so low it still appeals to many as a good enough way to force water to the house. One great drawback to the windmill is its unsightliness. This can be largely overcome, however, by installing the mill in an attractive tower.

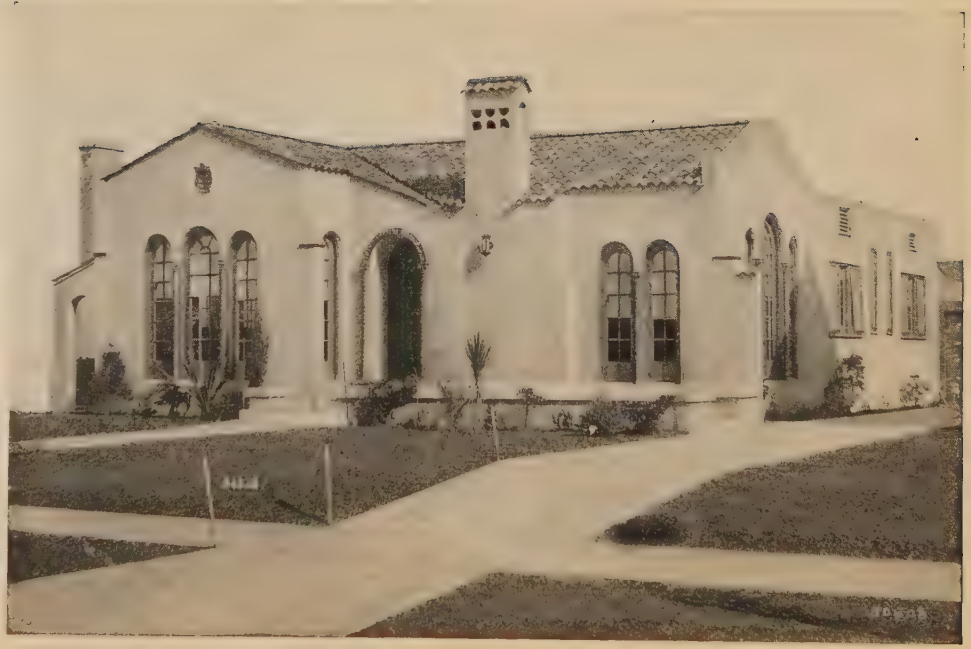
One of the latest and best methods of utilizing a windmill is to connect the pump with a pressure tank in the basement of the bungalow. When the mill is working, water is forced into an airtight pressure tank which delivers water to the fixtures on the floors above. The pressure in the tank is brought about in the following manner: the tank being airtight, when water is forced in by action of the windmill, air at the other end of the tank is compressed. After considerable water has been pumped in the air pressure rises, so that the more water that is forced into the tank, the more the pressure will be. From the tank pipes extend to the various fixtures in the house, and water is delivered to them under as high pressure as may be desired. In the best systems all control of the water supply to the tank is more or less automatic and an air safety valve attached prevents pressure in the tank from rising beyond the safety point.

Windmills on some country places continue to pump into a high tank from which water flows by gravity to the various fixtures in the bungalow. When a tank like this is used it should be located inside the bungalow or some other building instead of outdoors (as was the case in old-fashioned windmill outfits), to eliminate all danger of freezing. There is not much use in a water supply outfit that is frozen up several weeks every winter.

The ideal water supply apparatus for a country place is a power and pressure tank system. This eliminates the windmill, makes possible a plant that is always ready for business and can be automatically regulated to deliver water under any pressure, and the cost of maintenance is very moderate.

The pressure tank of a modern water supply system is usually located in the basement of the bungalow, or it can be placed in any other building kept warm enough to prevent freezing. Tanks are vertical or horizontal, de-

BUNGALOW OF MIDDLE-WESTERN TYPE WITH PARTIAL SECOND STORY.
FRANK LLOYD WRIGHT, Architect.



BUNGALOW OF THE SPANISH STYLE AS EXECUTED IN CALIFORNIA.

pending upon the amount of space and height available for the apparatus.

The most simple pressure tank system consists of a single or double tank to which water flows from the well outside. A hand or power pump used a little while every day (or every other day according to the capacity of the plant) forces water into the tank, from which it is delivered under pressure to various points in the house where it is required. A pressure gauge attached to the side of the tank shows the amount of pressure on the system at all times. When pressure gets low the tank is replenished by pumping more water into it.

A power pressure tank system is like the hand pump system excepting that the hand pump is replaced by a pump operated by a gas engine or electric motor. In the former case a gas engine may be connected to a small dynamo making electric current for lighting the house and grounds. The electricity so generated is also used for running the motor which operates the water supply pump. This is a very practical outfit for a country place where electric lights are wanted as well as a power pressure tank water supply system, one gas engine being sufficient to take care of both.

When a gas engine is connected to a pump the stopping of the engine can be automatically controlled. That is, by means of a valve operated by pressure in the pressure tank the engine can be automatically stopped when the tank pressure rises to a certain point.

A pressure tank system operated by an electric motor is the most convenient of all. With a motor attached the starting and stopping of the pump is entirely automatic, high pressure in the tank stopping the motor and low pressure causing it to start again. Thus a constant pressure is maintained and water flows continuously to the fixtures with little thought or care on the part of the house owner. In

such an installation an electric motor operates the pump (which also has a hand attachment for emergency) and the electric switchboard indicates at all times the voltage. A pulley attached to the drive wheel of the pump makes it possible to operate a cream separator from the same shaft, showing the possibilities with an installation of this sort on the country place or farm.

In some of the latest types of electrically operated water supply systems an electric motor is connected directly to the pump which forces water into the pressure tank. To control the motor a very ingenious electric switch is attached, which stops the motor when the tank pressure is high and starts it again when the tank pressure is low. When pressure in the tank falls below the amount for which the gauge is set an electrical contact starts the motor. As the motor operates the pump and water is forced into the tank, the pressure rises to the point where the electrical connection is broken, and the motor stops. Thus, the pressure tank supplies itself with water as needed, automatically discontinuing the supply when the tank is full.

Pressure tank systems like those described are not the only methods for solving the water supply problem for country places. Another system which has proved of great efficiency uses the pressure tank entirely for air, no water being allowed to enter the tank. This type is the compressed air system consisting of an airtight tank into which air is forced by means of a hand or power pump.

From the tank (air compressor) air under high pressure is delivered through an air pipe to the well, where it operates on a pneumatic pump placed inside the well. The pneumatic pump is an ingenious device consisting of two cylinders in which, by means of an automatic valve, compressed air forces water alternately out of the two cylinders, delivering a steady continuous flow to the fixtures at high pressure.

CHAPTER 9

WARMING SYSTEMS PRACTICABLE FOR BUNGALOWS

THERE are three general ways practicable for warming bungalows: by hot air, steam, or hot water. In considering steam heat it is desired to include the various types of "vapor" heat in which a vacuum or partial vacuum is employed in the pipes.

Nothing in the bungalow is more necessary for comfort than an efficient heating apparatus, so it behooves the owner to give some care to this vital problem. When the house is built and cold weather arrives the owner will suddenly be brought face to face with the results of his endeavors.

No matter how much money has been spent, the new home will prove uncomfortable if the heating system has been poorly devised. When considering plans and specifications during warm, sunny days of spring or summer, one is apt to forget the approaching winter. Then, too, there are so many other things to think about when building that one is apt to forget some of the utilitarian things like the heating system.

There are other considerations to seek besides comfort. Economy is quite as important—economy of coal consumption, of labor, and economy of first cost. To these it is desirable to add economy of wear and tear, for no wise house owner would think of buying and installing heating apparatus that he knew might require repairs in a short time.

Hot Air Heat

Hot air warming systems are the cheapest of all systems and are usually very satisfactory for bungalows.

Besides a lower first cost there are other advantages in hot air, and not the least of these is the ease and dispatch with which heat can be produced in even the most distant rooms in a few minutes. Just a few sticks of wood kindled in the firepot of a hot air furnace produce almost immediate results in rooms above. This is a special advantage in spring and fall, when it is so convenient to start a small fire before breakfast or after supper to take the chill off the rooms.

Another advantage a hot air furnace has is the immediate response it makes to sudden fluctuations of outside temperature. When drafts are opened to increase combustion after a sudden drop in temperature, it takes but a few minutes to raise the temperature of the house several degrees. Reversing the operation, when the weather turns suddenly warmer but a few minutes' time is required to check the furnace correspondingly.

There is still another advantage in the hot air furnace. Fresh air from outdoors is warmed and sent through the house. Thus there is no depreciation of vitality in the air, as when the same inside air is warmed over and over again without admixture of fresh outside air. Consisting, generally speaking, of three parts—fire pot, radiator, and casing—late types of furnace are excellent for the purposes for which they are designed.

The firepot of a furnace should be large—much larger than the average owner thinks is necessary for his bungalow. Even in small buildings the firepot should be excessively big, for a generous firepot permits of a deep bed of slow-burning fuel, while a small firepot allows only a small bed of fuel which must have high combustion to do the work.

The latter, of course, consumes more coal than the former.

Many firepots are corrugated instead of being round and smooth, as the former pattern is more durable and offers more heating surface. The radiator of the furnace is attached just above the firepot. Hot gases from the fire pass through the radiator (heating the latter) and thence pass to the chimney. Any one can see that the more heat that is being absorbed by the metal of the radiator, the less heat escapes up the chimney, and the more efficient the furnace will be.

Connected with the radiator (which is nothing but a sort of drum made of thin sheets of steel or cast iron to absorb heat quickly) are the heating pipes leading to the various rooms of the house. That is to say, these pipes do not connect *directly* with the radiator, but the latter opens into a sort of shell or chamber from which warm air is carried to the rooms by means of the furnace pipes. Somewhere in this space a water pan should be located (usually in the furnace casing, below) to moisten the hot, dry air before it is delivered to the rooms. This pan should be kept filled with water.

An improvement on the ordinary hot air furnace is what is known as the "underfeed" furnace. In this clever heater there is an arrangement of coal supply duct and operating lever for supplying fuel to the fire from *below* instead of from *above*, and the claim is made for this principle of heating that much less fuel is used and all gases are entirely consumed. To feed the fire the hopper is filled with coal, which is then thrust to its position on the grate by means of the lever operating a plunger for pushing the coal into place.

The "pipeless furnace" is now frequently used in small bungalows. It usually consists of an ordinary furnace located in the basement under a large register in the floor of a room on the first story. Warm air rises through the

register and cold air is drawn back to the furnace through a section of the same register devised for that purpose.

Combination Hot Air and Hot Water

Combination hot air and hot water furnaces are used in a great many homes and they have proven satisfactory and economical. A combination furnace is built like any other hot air furnace, but an auxiliary coil of pipes or a hollow iron casting is placed in the firepot. This coil is piped to a few radiators usually placed in the upper story. Thus there are two systems of heating—one by means of hot air registers in first story rooms, the other by means of hot water heat and radiators in upper rooms.

The cheapest system of furnace pipes is not necessarily the best. Double-jacketed pipes cost more than ordinary single pipes, but they are well worth while for vertical stacks because they waste less heat in the partitions. Such pipes consist of one pipe within another, an air space of about one inch being between the two. Basement horizontal pipes should be covered with heavy pipe-covering to prevent loss of heat. When the furnace is placed as near the center of the basement as possible, or slightly toward the side of prevailing winds, these horizontal runs of pipe can be quite short—a distinct advantage.

Hot Water Heat

Hot water heaters are preferred over hot air furnaces by many engineers, and systems employing hot water for heat have, in turn, many advantages. In the first place the hot water boiler of correct design burns less fuel than a hot air furnace. Next, it is less difficult to run the small pipes of a hot water system in floors and partitions than the larger furnace stacks. Added to these advantages are

longer life and a more equitable distribution of heat on windy days.

Hot water heating is mild and healthful. Modern piping systems are noiseless in operation, economical in cost, and when properly installed they last with few repairs. Most modern hot water heating systems are built on what is known as the "two-pipe" system. That is, lines of pipe extend from the top of the boiler to each radiator, entering at one end. From the opposite end of each radiator a return pipe leads back to the bottom of the boiler. Thus a complete circulation is established and the system once filled with water operates automatically. At the top of the house above the last radiator an expansion tank is located, and the entire system is filled with water until the water level rises about half way up in this tank. This *expansion tank* acts as a sort of safety valve. When the water is very hot (sometimes boiling hot) it can fluctuate up and down in the tank with no danger of racking any of the piping or radiators.

The same rules that govern hot air furnaces control hot water boilers. That is, every boiler should be located as near the center of the basement as possible; the firepot should be excessive in size rather than too small. It is the best practice to select a boiler at least fifty per cent larger than is actually required to do the work. That is to say, if a house requires 1000 feet of radiation, a boiler rated at 1500 feet should be used. Many heating engineers increase the size of the boiler even above this amount.

It pays to have a hot water heater covered with boiler covering, consisting of asbestos cement an inch thick, or sheets of asbestos and felt of like efficiency. It also pays to cover all exposed pipes in the basement with similar pipe covering. When this is done much heat wasted by radiation in the basement is saved.

There are vertical-sectional, and horizontal-sectional hot

water boilers. Either type is satisfactory, though, as a general thing, vertical-sectional boilers are used in small houses and horizontal-sectional in larger ones. Vertical-

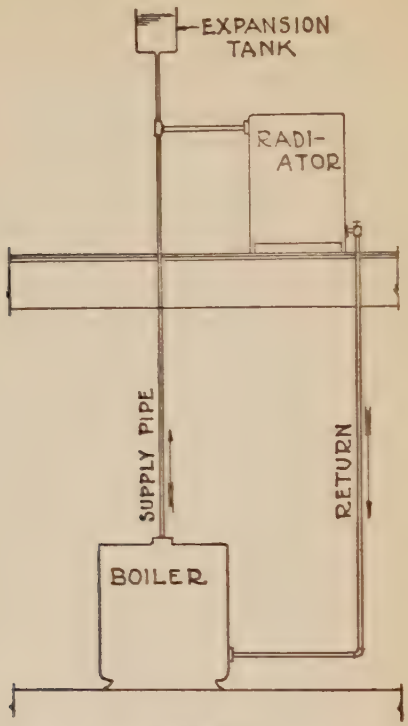


FIGURE XVII.
DIAGRAM SHOWING HOT WATER HEATING SYSTEM.

sectional boilers consist of several hollow castings (set one on top of the other) on a base containing the grate; the number of sections varies according to the capacity of

the boiler. Horizontal-sectional boilers consist of a number of cast iron sections (not unlike huge radiator sections) put together by means of bolts and rods.

Other types of hot water boilers are well known, such as steel riveted "fire box" boilers, steel "saddle" boilers, "magazine feed" boilers, and the like; some are complete in themselves, others requiring to be set in brick or supplied with a galvanized steel casing.

In boilers having the greatest efficiency the area of the firepot is slightly larger than the area of the grate. For instance, in a well known type of hot water boiler rated at 1025 feet of radiation, the grate area measures 3.14 square feet and the average area of the firepot is 3.20 square feet. Not a little of the efficiency of a heater comes in the careful adjustment of just these little points.

Lest some readers may not understand just what is meant by "boiler ratings" it may be well to give here a short explanation. Most boilers are built in several sizes, from the small ones rated at 450 feet of radiation to the large ones rated at 2725 feet or thereabouts. When a boiler is rated at 450 feet it is meant that such a boiler would (when forced to its utmost capacity) warm radiators containing 450 square feet of heating surface. Large radiators such as would be placed in a living room might contain 100 square feet of heating surface, each, and they would be termed "100-foot" radiators. When forced to its greatest capacity a "450-foot" boiler would be capable of warming four "100-foot" radiators and one "50-foot" radiator. As previously stated, however, boilers at least fifty per cent larger than what would be actually required should be installed to provide for utmost economy of fuel consumption. Thus, to warm the 450 square feet contained in the radiators mentioned, a boiler of sufficient size for 675 feet of radiation would be installed (450 plus 225 feet). If that actual size is not manufactured the next size larger would

be chosen, for boilers do not advance much in price from size to size and it is always better to have a boiler too large than one too small.

A door opening to the boiler flues should make it possible to clean the latter from time to time, removing the coating of soot which collects here. A wire brush with a long iron handle comes with most boilers for this purpose. Soot is a non-conductor of heat, and for this reason it should be removed from the boiler frequently to get the utmost of heat from the fire.

Ordinary boiler equipment consists of an iron lever for shaking the grate, a long-handled poker, a flue cleaning brush, a "slice bar" for breaking clinkers in the firepot, a thermometer to register the temperature of water in the boiler, and an altitude gauge to show the height of water in the system.

The latter instrument looks like the steam gauge on a steam boiler. It has a little hand which points to figures, and when the system is first filled with water the hand turns to a corresponding figure. Water in a hot water system is used over and over again, though a slight amount is sometimes lost through the overflow in the expansion tank or from evaporation. Lest the water get down too low, the altitude gauge is provided showing the exact level of the water at all times. When water gets down below a certain pre-determined point more can be let into the system in a moment by means of the water supply valve.

Steam Heat

Although ordinary steam heat is not used so much in small bungalows as formerly, it has its place in houses of more than ordinary size. Steam has many advantages. In the first place, steam radiators may be smaller than hot water radiators because steam is so much hotter than water;

smaller radiators are advantageous because they take up less room and cost less. Another advantage in steam heat is the possibility of having "indirect" radiators. There are many rooms where direct radiators would prove unsightly and in the way. For such rooms "indirect" radiators (located under the floor or in a partition) are very desirable. In this case heat reaches the rooms by means of registers conveniently located in floors or partitions. Indirect radiators are not practical with hot water heat.

Old-fashioned steam heating systems were frequently noisy. Many readers are familiar with the annoying snapping and cracking that came from steam pipes and radiators, and most people still think these are necessary adjuncts to steam heat. As a matter of fact, a properly designed steam system is quite as noiseless as a hot water system. When the boiler is correctly designed and the piping is properly installed, there is no reason why any noise should result. The main thing is to have pipes amply large, admitting no sharp crooks or turns in them and extending pipes in such a way that the water of condensation will flow back to the boiler without interfering with the live steam flowing in the opposite direction.

There are vertical-sectional steam boilers as well as horizontal-sectional, similar in many ways to hot water boilers excepting that the hollow space at the top is larger to permit steam to collect. The steam boiler is filled with water only part way up, instead of being entirely filled as in a hot water system.

Firebox steam boilers are also frequently employed, set in brick or cased with steel casing. In the "magazine feed" type the grate is "V" shaped instead of being horizontal, extending upward in the center. A magazine at the top is kept filled with coal. As the fire burns this coal gradually flows downward until it is consumed on the grate, the ashes dropping to the lower part. With this boiler cheaper fuel

can be used, and it is said to be economical and efficient.

Vapor or Vacuum Heat

Another type of steam heating which seems to be giving great satisfaction is what is known as the "vapor" system. An ordinary steam boiler is used, connected to radiators in a fashion similar to that of the ordinary steam system. By means of an automatic pump, however (or sometimes by other means) a vacuum or partial vacuum is maintained in pipes and radiators. This greatly facilitates the sending of steam to radiators (accomplished almost instantly) and all trouble from condensation is eliminated. Special valves are used with this system allowing heat to be turned partially or entirely on or off, thus permitting radiators to be cold, warm, warmer, or hot—a great convenience for varying conditions of weather.

Valves play a prominent part in the steam or hot water heating system. For a hot water system use "quick-opening" valves, opened or closed by a simple quarter turn of the hand. An improvement on this valve is the new "butterfly" valve which permits shutting off heat with the foot. An improvement on the ordinary steam valve is what is known as a "packless" valve. Anyone who has had experience with ordinary, leaky steam valves will appreciate the new kind, said to do entirely away with leaks around valve stems. In these valves corrugated metal, inside, expands tightly around the valve stem and prevents dripping at this point. Special "modulation" valves are used for vapor heating systems. The handle can be turned for the degree of heat required.

Hot water air valves are usually opened and closed by means of a key which can be kept handily in a drawer when not in use. Since a hot water system is filled with water,

the opening of an air valve permits water to flow from the radiator. Hence the "key-handle," which should be kept out of the clutches of the mischievous small boy. The most convenient air valves for steam systems are "automatic" air valves, permitting air to escape from radiators but closing automatically when steam reaches the valve. Vapor systems require special air valves.

Thermostats

For hot air systems as well as hot water and steam systems a convenient device for saving fuel is the "thermostat." This little instrument placed on the wall of the living room or hall causes the drafts of the heater to open or close according to the temperature of the rooms. For instance (when the apparatus is set at 70 degrees), if the temperature falls to 68 or 69 degrees the thermostat causes the lower draft of the heater to be opened, at the same time closing the check draft in the smoke pipe. If the temperature rises above 70 degrees the process is reversed, the thermostat closing the direct draft and opening the check draft. Thus, the fire is automatically boomed or checked according to the temperature.

Some of these devices are operated by clock work motors connected electrically with a battery; others are operated by an electric motor. Another well known type contains a metal bellows which expands or contracts according to temperature. This flexibility acts upon a volatile chemical contained in the system, which, expanding or contracting, transmits force enough to open and close the drafts of the heater.

Electric and Gas Heat

Electricity has not come into general use as a means of heating the modern home. Though electric heaters are en-

tirely practical and often most convenient, the cost of electricity in most places prohibits heating an entire bungalow in this way. However, for occasional auxiliary heat in the bathroom or sick room electric heaters are frequently used. One of the most popular types is set into the wall like a register, which it greatly resembles.

Gas heaters are used in very much the same way, either as separate heaters or in the fireplace (gas log). Many efficient types called "gas radiators" are like steam radiators in appearance. It is always desirable to have a flue connected directly with any gas heater, as the odor given off when gas is burning is sometimes quite offensive, if not positively poisonous.

Radiators

Some mention should be made of steam and hot water radiators, as many mistakes are made in this regard. Nine out of ten house owners give no consideration whatsoever to location of radiators; many architects who know better neglect to show radiators on their plans and finally, busy heating contractors after turning loose in the house a gang of heating mechanics are too often prone to set radiators hit-or-miss with no consideration of the best places for them. If radiators are located on the plans, the house owner will do well to check them over, carefully considering whether they are in the right places or not. Before considering the radiator problem one should understand what radiators are —how they are made, of what materials, and how they are put together.

There are sizes and styles of radiators for every possible location, long radiators and short ones, low radiators and high ones, thin radiators and fat. Special radiators are carried in stock for warming plates used in the dinner service. Another type of radiator has been developed for bathrooms and others for narrow halls and vestibules. Con-

cealed radiators are obtainable in a dozen varieties—in fact, it is impossible to conceive of a situation for which there is not at least one kind of radiator, and usually there are several possibilities to choose from.

Hot water radiators are like steam radiators, excepting that the upper ends of the sections are connected as well as the lower ends. In a steam radiator only the lower ends of sections are connected, the upper ends standing free.

In selecting patterns of radiators it is always most economical to choose those which are most easily obtained. All leading manufacturers now make what are known as "standard" styles, which though not precisely alike in design are so similar that they are to all practical purposes the same.

Before deciding upon the location for a radiator one should remember that the first choice of positions should always be nearest to the cold air. Neglect of this single point has probably caused more inefficiency in house heating than any other error. *Put your radiator where the cold air is* should be the slogan of every house owner. Right under a window is an excellent place for any radiator as it is at such points that radiators are most needed. With a radiator of proper size under the window, one may be certain that the cold air which comes in here will be warmed before it can chill the room.

Bungalow owners who desire seats built over their window radiators can easily have them, but they should understand that the mere placing of even an open shelf over a radiator cuts down the amount of heat because interfering with the circulation of air around the radiator. For this reason, when a window seat is built the radiator should be increased in size to compensate for the heat lost.

At the front entrance is a good place for a radiator, right beside the front door if possible, to counteract the cold air which rushes in when the door is open. This point properly protected may mean the difference between

a drafty house and one warm and comfortable. In many houses the entrance radiator is placed in a niche in the wall covered with a wood or metal grille, permitting warm air to circulate freely but obscuring the view of the radiator. When such an installation is desired what are known as "wall radiators" are often employed.

For halls or narrow corridors select tall, thin radiators, which will not project too far into the passage. Place them where you have reason to believe cold air exists. In a first story hall it is a good idea to have a sizable radiator near the stairs, from which warm air will rise and help heat the upper hall. If the hall is large, place a radiator on the stair landing, also, for you will find that almost any house is warm when the hall is warm.

For the serving pantry a "plate-warming" radiator may be used consisting of two or three sections of "wall radiator," set horizontally on legs, thus forming shelves on which plates can be warmed. An excellent location for such a radiator is in one of the pantry cupboards, in which case the cupboard doors should have panels of copper screening, permitting heat to escape to warm the pantry.

One of the most convenient methods for installing a bathroom radiator is to use a low radiator with a seat over, or use an indirect radiator under the floor with a register face in the floor. It is very convenient to have the bathroom radiator arranged in one of these two ways, for it permits one to stand (in the latter case) or sit (in the former case) over the warm radiator after a bath.

Many heating specialists recommend having an indirect radiator and floor register also in the first story hall near the front entrance, so that when the house mistress enters from outside in stormy weather she may stand over the register to dry her damp skirts and shoes. As a matter of fact, indirect radiators concealed in the floor are excellent for many other rooms in the house where wall space is

lacking for ordinary radiators. Such installations cost more than ordinary ones, but many are glad to pay the difference. Indirect radiation is customary for steam heat, only, as hot water heat is not usually high enough in temperature to warm successfully by means of indirect radiators.

Fuel

The kind of fuel to be burned in a boiler influences its design. Boilers designed for hard coal are not, as a rule, adaptable for soft coal, because the flues or smoke-ways of a hard coal boiler are too small for soft coal, which deposits an excessive amount of carbon or soot. For this reason it will be necessary for the owner to determine what kind of fuel he desires to burn, before selecting his boiler.

Hard coal and coke each require about the same capacity as to flue area, though the latter may require a different spacing of grate bars as coke usually requires more draft than hard coal.

Natural gas or artificial gas is used for fuel and in most cases an ordinary boiler is selected and the gas burner is set up in the fire pot. Where rates are not too high, gas proves an excellent fuel.

The lower grades of fuel oil are coming into use for house heating boilers as well as commercial boilers. In most cases the apparatus consists of an oil burner in the fire pot supplied from a tank, either by gravity or by pressure furnished by a fan or pump. Air is mixed with the oil, which vaporizes and forms gas. The entire apparatus is automatic and will continue to feed oil and air in proper proportions as long as the supply in the tank holds out.

CHAPTER 10

SUPERVISING THE BUILDING OF YOUR OWN LITTLE HOME

PART of the thrill of building one's own home comes during the construction of the building, when one goes to the property day by day to see the progress of the work. What feelings of satisfaction there are as we gaze upon the handiwork of the building mechanics and realize just how much work has been performed since our previous visit! Every stick of timber added to the building since the last visit is another step toward the realization of our dream.

There are annoyances, of course, as problems come up for decision daily. The owner is confronted with controversies and asked to make decisions often on unfamiliar matters. Then there is always the feeling that some of the work may not be quite up to specifications, or that the contractor is putting something over that may result, later, to the detriment of the owner.

Even when an architect supervises the construction of the bungalow, disputes come up as to the quality of the work. The architect and the contractor frequently disagree and the owner, himself, may not agree with the architect or the contractor.

Much of the trouble that exists on a job—for troubles there are at times—may be laid at the door of the owner, because he does not understand the technical details of building. Specifications are at best merely memoranda of the kind of material and character of workmanship that

are to go into the job and owners, having had no previous experience in many cases, take the specifications too literally. Conditions change daily and there may be reasons why the owner's interests might be improved if the specifications are slightly deviated from, here and there. For instance, an architect may specify a certain kind of lumber for a building. This quality may be practicable at the time when the specifications were written, but, many weeks later when the building is actually in process of construction, market conditions might make a change necessary owing to the impossibility of procuring the kind of lumber specified.

Then, as the job goes along, it might be greatly to the advantage of the owner to make changes of various sorts either in the plans or specifications. An architect of the better class is always looking out for the interests of his client, but no architect can with honor deliberately cheat the contractor in the interests of his client; a bargain is a bargain, but no contract will hold when disputed in court unless both parties have been treated with fairness and impartiality.

Many times the clauses of a specification are ambiguous. It seems beyond the capabilities of the human mind to devise any document that can be construed but one way. Every contract, each set of specifications, and every set of plans, no matter how carefully thought out in the first place or checked up at completion, is susceptible of different interpretations, and these interpretations are, of course, colored by the interests of the parties thereto. The owner interprets them to suit *himself* and the contractor's point of view is, of course, based upon *his* personal advantage or disadvantage.

So the inexperienced house owner is frequently left "between the devil and the deep sea" and unless he is willing to take the judgment of his architect (when he has an archi-

tect) or unless he feels he can trust the contractor, he is hard put to it sometimes to know just what to do.

To avoid many of these annoyances it is wise for the house owner to become as familiar as possible with the different problems before he begins the building of his bungalow. He should gain a little knowledge about masonry, the different materials and methods in vogue, so that he can be at least partially expert in judging the work of the mason contractor. The work of the carpenter should claim his attention, and he should know something about the different kinds of wood and the way the different parts of work in the carpenter's contract are performed. Plumbing, plastering, painting, glazing, and the work of all the other trades should be somewhat familiar to him before he starts in, so that as the various problems come up during the progress of construction he will be in the position of a quasi-expert and can be sure of making decisions with some degree of intelligence.

Many of the disputes between the owner and the contractor are occasioned because the former insists upon getting *more* than he is entitled to, usually, at the economic disadvantage of the contractor. Contractors of the better class are eager to please an owner and they will waive many of their rights under the contract for the sake of keeping peace with him, but of course there comes a time when the insistence of the owner may be so unreasonable and cause so much loss to the contractor that he is obliged to refuse to comply with the owner's wishes. When owners make unreasonable demands upon a contractor, nine times out of ten it is through ignorance on the part of the owner who is not technically capable of using good judgment on a point concerning which he has not general knowledge. Frequently relatives and friends who lack technical knowledge advise him to insist upon this or that and thus fuel is added to the flames.

The best way to familiarize oneself with the general construction of a building is to read diligently books and papers on the subject, and whenever possible examine the construction of any house that may be going up in the neighborhood. If prospective bungalow owners will do this, they will be surprised how quickly they may obtain knowledge about all the important points in building until finally they are as expert as the architect or contractor.

Most owners do not need to be urged to inspect their property frequently during the process of construction of their bungalow, for self-interest almost compels one to do this. At periodical inspections they should be intelligent in their criticisms of the work.

It is a good idea to take a notebook along and note down a list of things which do not meet with your desires. Preserve the notebook until the end of the job and *write* the architect or contractor your instructions. Thus, you will have some sort of indisputable check upon the items under fire.

You should, of course, talk these items over with your architect or contractor before taking any very decided stand, as you may find that you are all wrong in your ideas and they are all right. After a conference, however, any business man ought to be able to come to an intelligent decision after hearing all sides of the question, whether he is particularly expert concerning the items involved or not. Building a bungalow is merely an ordinary business proposition from start to finish; if the owner tries to "gouge" the contractor he will probably find it cannot be done to advantage. On the other hand, if he is fair and square and the contractor is of the same turn of mind he will find little difficulty in settling disputes amicably, if indeed, there are any disputes.

The first matter to attract the attention of the owner when visiting the scene of operations will probably be the

excavation for the basement. He should look over the excavation and make sure that the soil at the bottom upon which the basement walls are to be built (and which must, of course, support the weight of the building) is firm and solid. Clay, or sand mixed with clay, makes a good bottom to receive this weight. Loam or other soft earth will not support the weight of a structure, so if the bottom of the excavation appears to consist of soft earth of this character, ditches for receiving the footings should be dug down to hard-pan.

When the excavation is started be sure and caution the contractor to separate the loam (rich earth) from the ordinary dirt, as it will be needed later when the finished grading is done. The rich earth should be piled in one or more piles out of the way of building operations, where it will not become contaminated with the poorer soil, or trampled upon during the progress of the building.

As the foundations are being built and after they are completed it will be comparatively easy to check them up and see that they are well built. When of stone the joints should be completely filled with cement mortar, so that after several days when the cement shall have been given time to harden a knife blade will not readily penetrate them.

When of concrete, foundation walls should be so hard within a week that they "feel" hard when the point of a knife is applied to them. If of concrete blocks, the blocks themselves should be "well cured," that is, as hard as stone; the joints should be thoroughly filled with cement mortar.

It is a good idea to require the foreman to prove that the top of a foundation wall is level by applying a straight edge and level; otherwise, when the carpenters come to build the sill they will have to shim up the timber with chips, as the sill must, of course, be perfectly horizontal.

The foundation wall should be absolutely level to receive this timber.

Architects usually write rigid specifications for lumber, but rarely does the material come entirely up to the quality specified. Lumber is a product of nature, cut and worked by man, and nature is not very exacting when it comes to preparing building material. Sound knots are to be expected in lumber and they are not detrimental. It is also expected that lumber will be more or less rough and that there may be here or there in a stick of timber, a slight wind or twist. There might even be a check or splinter or two, which would not in any way impair the strength of the timber.

The main idea in building a bungalow is that the lumber shall be reasonably dry and sound and that it shall not be "shaky," weak, or saturated with sap. A little judgment on the part of the owner will help him to judge the lumber pile intelligently and fairly. Some pieces of timber may have to be condemned.

As the framework goes up, the owner will be interested in the kind of workmanship he is getting. All timbers should be thoroughly spiked, and partitions should be straight and true. It is comparatively easy to tell a good job from a poor one by a little careful inspection. Where timbers extend over wide door openings, they should be strengthened by using larger timbers or by doubling up two or more smaller timbers; some openings require trusses over them to carry the weight of the floor above.

The vertical walls of the building should be braced by pieces of timber or boards spiked in between studs (called "bridging"); the floor joists should be braced in a like manner.

As the outside boarding is applied, the owner can readily determine its quality and ascertain whether it meets with the requirements of the specifications. Owners should not

expect clear boards such as would be used for the finished exterior of a bungalow; he will find a few knot holes here and there which will not prove detrimental, but the material should be sound and well nailed.

See that the carpenters cover the outside of the boarding with the storm and wind-proof paper required, and (most important of all) see that this paper is in good condition, tightly fitted to the window and door frames and at the cornice before it is covered up by the finishing material used on the outside of the building. A building well papered will prove much warmer than when the job is poorly done.

Metal work of the gutters and flashing should "prove up" when examined in detail. Most architects specify certain brands of tin or copper of specified thickness; the former can be checked by noticing the brand stamped on each sheet —the latter may be tested for thickness by requiring the contractor to gauge it in your presence.

Watch the flashing and make sure the metal extends the specified distance above the gutters, to prevent snow from backing up under the roofing material and causing leaks.

Downspouts should run straight and true from roof to ground, and the average eye will detect any deviation from the perpendicular.

As the plumbing and heating pipes are installed the owner will have no difficulty in mastering a complete knowledge of them, for the amount of work accomplished each day is comparatively small. See that the plumbers do not cut away timbers too much in running their pipes through the floors.

When the plumbing stacks are tested by filling the system with water, the owner can be present and assure himself there are no leaks by inspecting the stacks carefully from top to bottom. Even a slight appearance of moisture at joints indicates leaks at these places; cracks or splits in

pipe or fittings are readily seen, and this faulty work should be pulled out and done over again.

The conduits of the electric wiring can be examined from time to time to see that each outlet is connected with a continuous line of this fireproof piping; later, when the wires are drawn through the tubes by electricians, the owner should assure himself that all splices and joints in the wires are thoroughly soldered and taped. At the completion of the electric wiring the electrician makes a test of his work by sending a battery current through each circuit and ringing a bell in this manner. The owner may be present at this test if he desires.

When it comes time to plaster, the owner should assure himself that the lime used in the plaster is mixed in the mortar boxes well in advance of the arrival of the plasterers, so that it may be "cool" (thoroughly slaked) when wanted. "Hot" mortar is detrimental to a good job, because it will continue to "work" after it has been applied on the walls and cause "popping" and "blisters." See that the first coat of plaster is applied with sufficient pressure to squeeze the material into the spaces between laths, so that it may clinch the laths securely and hold firmly.

When mechanics are lazy or indifferent, they will not push the material with sufficient force against the lathing. Besides, good troweling uses up more material and some contractors are inclined to skimp at this point.

The remaining coat (or coats) of plaster should be well troweled and the final coat should be true and even over the entire surface. Mechanics frequently are careless where they bring the plastered surface against the wood strips (called grounds). When carpenters come to apply window casings and baseboards later, it is found that there are wavy places where the woodwork will not fit tightly because of unevenness of the plastered surface. Examine each room carefully to obviate this difficulty. Also, in

the angles of walls and ceilings see that the lines are straight and true.

Roofing material will be observed by the careful house owner who wishes to assure himself of a good job. Whatever material is specified, one may readily check it up and see that it is up to specifications.

Tile work used in bathrooms and other places is not always understood by owners, who frequently expect a more perfect result than can be obtained. White glazed tile such as are used in bathrooms are straight and true and may be expected to produce perfect work, but most colored tile such as are used for mantels and the floors of sunrooms and porches are usually somewhat warped in the baking. They are even frequently out of square and some are slightly smaller than others.

In this case it is necessary for the mechanics to lay them intelligently and try to take up the difference in size by manipulating the mortar joints. When properly laid, tile of this kind look well, even though a minute inspection might show slight irregularities in size and shape. As a matter of fact, a reasonable amount of this deviation adds to the beauty of the material, giving it a more interesting texture than would be possible if every tile were perfect (as in a bathroom).

In placing the finished woodwork of the interior (consisting of floors, trim, and stairs) the first requisite is that the woodwork shall not be delivered at the building when the building is damp. This means that the plaster should be thoroughly dry and it is a good idea, even, to see that the concrete floor in the basement has been laid as well as the tile floors throughout the building, or any other work in which liquids are used.

If the home is built in winter, heat must be kept on at all times, of course, particularly during the process of trimming, because dampness gets into the unprotected woodwork

and then when the material dries out, later, joints open and show unsightly cracks.

Different mechanics are employed on interior trim than would be used in erecting the rough framework of the building, though many carpenters do both kinds of work. See that the mechanics cut and fit moldings accurately. Require the finished floor boards to be driven up tightly and thoroughly nailed. Do not expect every board to be precisely the same color and grain, because wood does not come that way. A certain variation in color and grain will not be conspicuous when the floors are stained. The same thing applies to casings and doors; there will be a variation in grain and color and this is not considered displeasing by most experts.

As the painting comes along, the bungalow owner can detect the brand of paint used by inspecting the cans in which it is delivered at the building. He may judge of the workmanship by watching the result of the different coats as they are laid on. Owners are frequently unreasonable when it comes to judging paint. The average piece of work in a bungalow will not come up to the grade of that used in "cabinet" work. Brush marks may be visible here and there, or possibly other little imperfections which would not be sufficiently bad to require being done over. A reasonably good job can be expected, however, according to the number of coats specified and the mechanics should be required to go over all woodwork which does not come up to this grade.

When ordinary glass is specified for windows, the owner should understand that he will not get perfect glass free from bubbles or other imperfections. Even when the best grade of window glass is specified one may expect a few little imperfections in the panes, here and there. Glaring imperfections, however, should be condemned and the glass contractor required to substitute more perfect lights. When

plate glass is specified, the owner may expect and should insist upon glass that is absolutely perfect. It is easy to understand the difference between ordinary glass and plate glass by looking at a sheet of glass sidewise; plate glass has a sheen not found in common glass.

Owners should not expect a perfect job in leaded or metal bar glass, because these little bars of metal are made up of strips soldered together by hand. Of course, soldering shows when the work is finished. This is not considered detrimental; in fact, artists consider that such windows are more artistic because showing the marks of the craftsmen as opposed to the work done by machines.

Finally, the owner will be required to give some attention to the finished grading about his bungalow, as well as the trees and shrubbery with which his lawn will be embellished, it is to be hoped. This brings up the subject of sidewalks, their location and construction.

The location of sidewalks must be borne in mind before the finished grading is started, and then the rich earth can be scraped and raked into position where it will not conflict with the walks when they are built. In the meantime the walks may be laid so that in the final raking over of the soil in preparing it to receive seed the earth will come tightly up to the walks.

Most owners are fairly familiar with grading. The main points are to see that sufficient of the rich soil is put on top of the poorer soil below, to permit a good growth of grass. Also, take care that the lawn is sloped properly away from the bungalow, so as to drain away from the building.

CHAPTER 11

THE ILLUMINATION PROBLEM

WHEN the framework and walls of your bungalow have been built and the roof is finished to the point where it is tight, it is time for the plumbers to get on the job and do the rough piping for the bathrooms and kitchen. This work is quickly followed up by the piping for the furnace or other heating system and then you will be ready for the electric wiring.

It is not a good idea to start electric wiring in advance of the plumbing and heating pipes because the latter must be run in specific locations in the walls and floors, in order to reach the various plumbing fixtures, whereas electric wires are much more flexible and can be readily extended in almost any direction. If the electric wiring system was installed before the plumbing and heating pipes, a run of wire might be found in the precise spot where plumbing pipes should go. For this reason get the plumbing and heating man on the job first and then the electric wires can be extended in any left-over wall spaces where most convenient.

The locations of all your electric light and power openings (called "outlets") should be carefully studied and located on the plans well in advance of actually building them in place, for one of the greatest annoyances in building is to find, too late after the plastering is done, that certain rooms are inadequately provided with fixtures, or that

the lights planned for a dresser have been put on a wall where there is not room for the dresser, or that a floor plug is not in the best location for the piano, and so on. By the time you are ready to study the lighting system, it is to be hoped you will have some notion of the way the furniture will be arranged in the various rooms, so that you can intelligently locate the different lighting fixtures on the plans.

Taking the living room as an example, decide where the table can best be placed and at this point plan for a floor or base plug, so that the table lamp will not need to be plugged into an ordinary wall bracket but can be accommodated by its own cord and plug located conveniently nearby. Then there is the piano to light by means of a piano lamp or desk lamp on the music rack, plugged into a receptacle right beside the piano in just the proper place to obviate the necessity of running an unsightly cord along the floor or up the wall. Living room tables are often placed behind a davenport in front of the fireplace or at one end of the room and it is good practice to provide a floor or base plug for the davenport itself, so that a floor lamp can stand at hand for reading. This convenient piece of furniture offers a most comfortable place on which to lounge for reading purposes when there is the proper light nearby.

The modern tendency is to use more electric lamps and less ceiling or wall fixtures. Nothing is prettier or more cozy in any room than lamps, which serve a very practical purpose in that they are economical in current consumption, because reading places in the room can then be illuminated directly without requiring general illumination of the entire room. Many bungalows are now built having no ceiling light in the living room; as good looking ceiling fixtures are quite expensive there is considerable saving when they are not employed.

The ordinary living room requires about four base or floor plugs (one for each side of the room) and four wall brackets. No ceiling lights are required unless desired. With all the brackets and several electric lamps turned on when the room is to be brightly lighted for guests, the general illumination will be sufficiently brilliant. Then, when the family is alone, just a lamp or two for ordinary reading purposes will usually prove sufficient.

The dining room, of course, must be provided with a ceiling light to hang over the dining table and in addition it may be well to provide two wall brackets, one for each end of the sideboard, or in a large dining room, two more wall brackets. In many dining rooms a floor plug is provided under the table for an electric lamp or an electric toaster or coffee percolator.

An ordinary hall requires a ceiling light or wall bracket near the stairs, with another light at the rear of the hall, and it is well to have a floor or base plug for a table lamp as well.

Bedrooms can be lighted in many ways. For general illumination it is very convenient to have a small ceiling light to be switched on at the door upon entering the room. Then illumination will be required at each dresser, chiffonier, or wardrobe. For the ordinary dresser or dressing table you may have a wall bracket at each side of the mirror or you may use a single light dropped down in front of the mirror on a silk cord. With a silk shade to match, the appearance is very smart and the illumination quite satisfactory if the light is placed just above the level of the head and between the head and the mirror; about 18 inches from the wall and centered on the mirror is right in most rooms.

There should be three or four floor or base plugs in the principal bedroom so as to accommodate a desk, a table, and possibly a floor lamp for reading purposes. It is a good

idea to have a floor or base plug beside each bed so that a lamp can be placed on a table there.

Bathrooms require merely a moderate amount of illumination, because white tile or white painted walls reflect a large amount of light. A small ceiling light and switch is good for general illumination and will often be found sufficient for all lighting purposes in a small bathroom. Shaving, of course, is an important function in the bathroom, so a wall bracket on each side of the mirror or a single drop in front (like the dresser drop already mentioned) will be found practical.

The kitchen should be illuminated in such a manner as to make housework easy and comfortable. A ceiling light will often illuminate a small kitchen without the addition of other lights, but most kitchens are improved by adding a light at the sink and one at the range.

The refrigerator, of course, should have a light in front where it will shine directly inside, and the pantry must be properly illuminated, so that the busy housewife or her assistant can readily find what is wanted.

A library requires a floor plug for the center table, brackets or plugs at the bookcases, brackets for general decorative purposes, and a few floor or base plugs for reading lamps where desired.

Many owners make the mistake of putting in too few switches and then when the bungalow is completed they are constantly subjected to the annoyance of going into a dark room and hunting around for the keys to fixtures. A few extra switches even if seldom used are better than too few switches, and the increased cost at the time the building is built is not excessive.

There should be a switch just inside the front door for lighting the hall and another switch in the same location will be found useful for lighting the light on the front porch.

Then, there ought to be a set of what are known as

"three-way" switches for the lower hall and upper hall in bungalows having rooms on the second floor. Upon pressing a button at the foot of the stairs the fixture in the second story hall is lighted, then upon ascending the stairs the same light can be extinguished. At the same time the fixture in the lower hall can be lighted, either from a button upstairs or from the downstairs button. Thus, it is always possible to light up either hall in advance of passing up or down stairs.

A switch should be provided for lighting one or more lights in the living room, and another one for lighting the dining room ceiling fixture is necessary.

It is excellent practice to have a switch just inside each bedroom door to operate a light, and each bathroom, of course, should be provided with a switch which can be readily found in the dark.

Some architects specify a switch in the owner's bedroom for controlling several main lights in a prominent place in the living room, hall, or dining room as a precaution against burglars. It is quite comforting to have such a switch which can be conveniently operated if a noise is heard in the dead of night.

There are two general methods for wiring bungalows. The first, known as "knob and tube" work, consists of ordinary insulated copper wire run in partitions and floors and attached to the same by means of porcelain knobs screwed into the timbers. Where such wires pass through holes in the timbers, they are safeguarded from fire by a tube of porcelain which provides adequate insulation. This is the cheaper system of wiring and is not to be recommended except for the cheaper class of bungalows. Indeed, in most cities or towns where building laws are strict such wiring is prohibited, because after a term of years when the insulation dries out it is apt to disintegrate and drop off, leaving the bare copper wire exposed.

The latest and best system of wiring is what is known as "conduit" work in which a complete iron pipe is run to all fixtures and the insulated copper wire is drawn through the pipe. Thus, no wire can touch any wood or other inflammable material. In this system the "outlets" to which the lighting fixtures are fastened consist of iron boxes, through which the wire is drawn and connected to the lighting fixtures.

In considering the design of electric light fixtures one has an opportunity to exercise taste, for not only do they serve the utilitarian purpose of furnishing light but are an important means of decoration as well.

"Candle" fixtures are deservedly popular for ceiling and wall lights and they can be had in many pleasing styles and sizes, with or without shades. Often candle lights are used with frosted bulbs, in which case no shades are required as the frosting of the bulbs is sufficient protection against glare.

For living room walls double-candle brackets may be employed, but in a small bungalow a single-light bracket is usually chosen for the dining room. If candle brackets are to be used in bedrooms, care must be taken that such fixtures when used at a dresser or chiffonier give sufficient light to illuminate the mirror properly.

For the living room ceiling as well as the chandelier over the dining table a five-light candle chandelier can be recommended. Formerly "art-glass" domes were very popular for this purpose, but the newer bungalows are equipped with candle chandeliers.

At the front entrance, outside, a lantern of medium size is usually to be preferred, while in the hall itself one may use a pleasing form of the old-fashioned lantern hung on a chain.

For country places where city electric light current is not possible to get, the bungalow owner can install his own

little electric light plant. This usually consists of a gasoline engine connected to a small dynamo with a storage battery attached. The dynamo feeds current into the battery from which current is then drawn to the fixtures and the entire process is reasonably automatic, requiring but slight regulation. The entire apparatus is very similar to an automobile lighting system, and the cost is within the means of most owners able to build a bungalow.

Owners of bungalows in the country can also have their own gas lighting plant if they choose, consisting of either acetylene or gasoline gas, arranged in a convenient plant and safeguarded from danger. "Bottled" gas is also a possibility in sections not too far from a plant where bottled gas is manufactured. The bottles are small tanks of steel delivered to your door and connected up to your lighting system which they will supply until the gas is consumed, when it is necessary to attach a fresh tank. This system is like the small gas tanks formerly used on automobiles, except that the house tanks are of very much greater capacity.

CHAPTER 12

BASEMENT AND ATTIC

THERE are two places in every house or bungalow which may be said to exist by reason of necessity, only, and these are the basement and attic. Of course, in a one-story bungalow there is no attic, unless you dub the space up under the roof an "attic"; however, even in small bungalows there is a space here often wasted which can be turned to good account by adding a small staircase or even a folding ladder for access and egress.

The attic and the basement are often the most poorly arranged spaces in the new home. Owners are usually much more interested in the arrangement of the living room, dining room, and kitchen and there doesn't seem to be any time left over for consideration of such an inelegant problem as the basement and attic. For those who consider the proposition carefully, however, the resulting comfort obtained thereby is well worth while. Space underground and overhead costs the owner something in cash and he is entitled to the same returns from this investment that he gets from any other portion of the new building—returns in convenience, economy, general usefulness, and increased happiness.

"Down cellar" is the rather common term for that portion of the house which extends below ground, a part too often poorly considered or not considered at all. The average home builder gives considerable attention to the arrangement of rooms on the first and second floors, but when

it comes to the basement very little account is taken of it. Often, when building a new home the cellar is dug, foundation walls are built, and the house is completed only for the owner to find when he moves in and attempts to fit his goods into the house that he should have done this or that to make the basement more useful.

One of the questions often asked architects and builders is, "Should a basement extend under the entire house?" It is the consensus of opinion that it should. Since you are obliged to extend the foundation walls of a new house deep enough in the ground to get footings below the "frost line" (to prevent freezing and thawing earth from heaving the walls) and since only about a foot more is required to provide for a basement, why not have the basement under the entire house? (This applies to northern climates, of course.) The cost is very little more and rooms above will be drier and more healthful. Then there is the advantage of plenty of storage space—a requirement lacking in too many homes. A basement under the whole house also permits of extending heating and plumbing pipes with greatest ease and economy.

"How high should the basement be?" is another question often asked. There is no rule about this but you will find that a height in the clear of 7 feet is usually sufficient to give plenty of room for furnace or heating pipes. Many persons who have walked about low basements know the annoyance of ducking one's head to dodge heating pipes and will appreciate the advantage of having a high basement.

With a required height of 7 feet for the basement, the next point to determine is how much of this should be below ground and how much above. Designers usually work backwards when settling this point, first determining how high the cellar windows ought to be. In many modern houses 24 inches is considered a good height for windows,

so a distance of 30 inches is allowed (24 inches for the window and 6 inches for the sill) for the distance from the ground to the basement ceiling; the balance of the 7 feet (4′6″) is below ground. There are no strict rules for this, however, and each owner must determine the dimensions himself, bearing in mind that cellar windows should always be sufficiently large to give plenty of light and air. When windows need to extend below the ground level, area walls can be provided around them.

The time to consider the arrangement of a basement is when working plans are being made. After a bungalow is completed it is often too late to make changes, as owners have frequently found. Owners, too, are often surprised to find how low the basement is and how poorly lighted. All these and many more disappointments can be obviated by a little study *before the bungalow is actually started.*

If the building is already built when one begins to plan the arrangement of the basement, a little more study may be required. It should not be difficult, however, to make of this often useless part of the house a well-arranged and convenient room or series of rooms that will greatly contribute to the efficiency of the house.

One important point to consider in the basement is the location of the heating apparatus—usually near the center of the bungalow, so that pipes can radiate from the furnace or boiler an equal direction on all sides. As a general thing the heating department of a basement should be enclosed by a tight, dust-proof partition and door, for from here comes most of the dust which you must prevent from entering other portions of the basement or rising to rooms above.

A dust-proof partition can be made of two thicknesses of wooden sheathing with a layer of building paper between, tightly fitted to the ceiling. Another good way is to use wall-board with a wooden cleat nailed over each

joint, or, at completion a layer of building paper can be pasted over the entire surface of the partition effectually covering all joints. The ceiling over a boiler room should be plastered or covered with wall or plaster-board with all the joints made tight. This is to prevent dust from rising to rooms above. On the ceiling, over the top of the furnace or boiler, you should apply sheets of galvanized iron for protection from fire.

A coal bin should, of course, be near the heater. Here is another place for a dust-proof partition, for coal dust is very penetrating. In addition to the slide where one shovels out the coal a tight door should be hung. Naturally, a coal bin will be located in a corner and contain a window or coal chute, so that the bin can be readily filled from outside. To prevent the necessity of carrying coal in sacks or baskets build the bin next to a driveway, so that coal vehicles can drive right up to the chute. For the coal opening use a "coal chute" consisting of a glazed iron window and frame. There are very durable, whereas the ordinary wooden coal window soon gets battered.

The next problem to consider in connection with the heater room is this: Where will you store ashes? How will you handle them? Some owners take ashes from the furnace every day and carry them into the yard. Others have six or eight galvanized iron ash barrels for storing ashes in the basement. When these barrels are full they take them out and empty them.

One of the most convenient systems of ash storage is what is known as a "rotary ash receiver" built into the basement floor directly under the heater. Each day's supply of ashes drops from the grate right into an ash can and as each can is filled the receiver is rotated to bring an empty can under the grate. When all are full they are taken outdoors and emptied. For those who store ashes in ordinary galvanized iron barrels a crane for lifting the heavy bar-

rels out of the basement is very useful. Such a crane can be built by a carpenter, or any man handy with tools.

Probably the best place for a laundry is on the first floor; however, it is usually less expensive to use a corner of the basement for a laundry, often under the kitchen where the plumbing pipes are handy. With the heater room enclosed by a dust-proof partition, it is not strictly necessary to enclose a laundry. In most cases, however, it will be found better to separate the laundry from the rest of the cellar, so that all dust can be kept out.

With a hard cement floor in the laundry (which should also extend throughout the entire basement), many find it uncomfortable to stand at the tubs. To correct this have a little wooden slat platform on which to stand.

Storage of food supplies is the next thing in the basement to require attention. A vegetable room and fruit room should be provided, the former with open slat bins so that potatoes and other vegetables can be spread out loosely to prevent decay. Good ventilation should be provided by means of a window which can also have a shutter to close when it is desired to keep the room dark. The fruit room (for canned goods and preserves) is similar to a vegetable room, but with open shelves instead of bins. Here again there should be good ventilation, and shutters ought to be provided for excluding light, as many kinds of preserves keep better that way. Often a vegetable room and fruit room can be combined in a single room containing bins and shelves.

For another basement convenience build a trunk rack of open timber work and store empty trunks up off the basement floor to keep them dry. In a well aired basement it will be found more convenient to keep empty trunks here than to carry them up to the attic.

A place for storing storm windows and screens can be

readily made from scantlings and it will be found one of the greatest conveniences in the basement.

Those who like to work with carpenter's tools will want to preserve the space under a window for a good tool bench with a cupboard above with lock and key. Camera fans usually like their dark room in the basement, frequently next to the laundry where the plumbing is close at hand. Then a basement toilet room equipped with a water closet should not be forgotten, with its own outside window. Sometimes a bathtub and wash bowl are included.

Now we come to that other part of the building where frequently so much space goes to waste—the attic. As a matter of fact, we may say that some bungalows do not require attics. This should be one of the first points to be settled by the house owner—to have, or not to have an attic. In the latter case the roof can be made low enough to cut out wasteful attic space, and the house will remain cool if the loft space is ventilated through windows or by means of a ventilator in the roof or chimney.

To those requiring an attic, however, the hint may be given that it should be something more than a huge unused space left over. Use the space and get some benefit from it. Attic bedrooms can be made comfortable when there are two windows, one on each side of the room, to secure "cross ventilation." Provided for in this way, attic rooms can be made quite as livable as any others. When servant's rooms are in the attic a servant's bath should be provided, located above one of the bathrooms below.

A great attic convenience is a moth-proof, cedar-lined store closet, usually having a single door opening into a commodious space lined with cedar sheathing. Shelves extend from top to bottom. Space under the eaves can be utilized for drawers in some places and cupboard doors in others. In every case the housekeeper should carefully estimate the amount of storage space required and fit up the attic ac-

cordingly, as it is hardly worth while to spend money equipping an attic with cupboards in excess of those actually required.

Many unfinished attics have been made habitable by nailing "finishing boards" to the underside of the rafters and on the walls. There are several well known brands of this board which usually comes in large sheets. It is easily applied and looks well at slight cost, and it does away with the muss always accompanying plastering.

An attic playroom for the children will be found a most useful space for rainy days, and now that radio outfits are so universally popular, many home owners are mounting their apparatus here for the general amusement of the family.

A playroom is made much more useful when it has cupboards along the walls for putting away the toys; thus the room will serve a double purpose and can be used socially for dancing when the occasion arises.

The attic billiard room gives returns and usually proves an interesting means of amusing members of the family and their guests. When the billiard room is located at the top of the building, one should be careful that the stairway leading thereto is sufficiently wide and straight to permit the billiard table to be brought in, later. A billiard table "knocked down" can be carried on edge and requires not much more space in carrying than a large dining table.

CHAPTER 13

KITCHEN AND LAUNDRY: THE WORKING PARTS OF THE BUNGALOW

IN so far as the housekeeper is concerned, the two most vital departments of the bungalow are the kitchen and laundry, for here it is that the most difficult tasks are performed. No household can be a happy one when the house mistress, in a poorly arranged and inadequately equipped household workshop, struggles along with her tasks wearing herself out over work that could be done more efficiently, in half the time, with much less labor, if the working arrangements of the bungalow had been more carefully planned in the first place.

The kitchen should be intelligently designed to perform its various functions with minimum of labor. These various purposes of the kitchen will be found to group themselves under three general departments: the storage of food, the preparation of food, and the storage of dishes and utensils in their relation to the preparation and serving of food.

When considering the storage of food it will be found that many old-fashioned ideas have recently gone into the discard and food can be stored more scientifically in much less space than formerly. In many modern bungalows there is no pantry for storage purposes and this saving in space has been found to eliminate much hard work. With a pantry the housekeeper has one more room to take care of and keep clean and as the pantry is usually at some distance from the kitchen table, kitchen range, and sink, travel to

and from the pantry makes many unnecessary steps. A pantry-less kitchen is entirely practicable for even a large family when the kitchen cabinets which take the place of the pantry are carefully designed to provide adequate storage space for food and dishes.

In the ordinary town where the grocery store is not too far from the home and where every home has a telephone connection with the store, it is found unnecessary to carry a large food supply on hand. In other words, the modern idea is to let the grocer carry the stock of provisions and use his shelves for the storage of your food instead of cluttering up your home with it. In most towns groceries are delivered daily and can be ordered in small quantities from day to day at but a slight advance over the cost of larger quantities. This slight increase in cost need not be considered as uneconomical because the increased investment for storage space in a home where a larger amount of supplies is required will usually offset the ordinary saving when foods are stocked up in the home in larger quantities.

A kitchen cupboard or cabinet will be found entirely adequate to carry the amount of food supplies ordinarily required, and when the cabinet is located right at hand on the kitchen wall adjacent to the kitchen range the utmost in labor saving is made possible.

When the plans for the bungalow are made the kitchen arrangements should be carefully studied to make sure there is no waste space. The ideal kitchen is located on one corner of the building, so that there can be light and air on at least two sides of the room. This permits of cross draft which means much toward keeping the kitchen cool.

Compactness is above all things important and to achieve this result it will be necessary for the housekeeper to enumerate the various articles which are to be used there, so as to make sure they will be properly planned for. To

BRICK BUNGALOW OF CONSIDERABLE SIZE.
CHARLES E. WHITE, JR., Architect.

SMALL SHINGLED BUNGALOW OF EXTREME SIMPLICITY.

the kitchen range and kitchen sink, together with cupboards for the storage of food, dishes, and utensils should be added the kitchen table, and possibly a kitchen cabinet; then, with sufficient working space provided in addition, one can determine the size of the kitchen.

A small kitchen is the delight of all housekeepers, because when it is efficiently arranged and adequately equipped it is much less laborious to do the work there. The kitchen sink should be placed on a wall under a pair of high windows when possible, or on a wall with the end toward a window so the daylight will shine directly on the sink without shadow. Placing a sink on an outside wall is not impracticable, as the water pipes can be extended inside the room and not out in the wall where they might freeze.

A sink with two drain boards is preferred, as two drain boards greatly facilitate the handling of dishes. If the kitchen table can be placed within reach additional convenience is assured.

The kitchen table may stand against a wall or in the center of the room depending upon the size of the space. In any event it should stand close to the range and within reach of the sink. When a kitchen cabinet having a table shelf is used, no ordinary table is required, though many housekeepers prefer to have a table in addition to the cabinet.

It goes without saying that the range should stand in such a position that the full light from a window nearby will fall on the top of the range. If the window is at one side of the range, be sure the oven does not come between the window and the top of the range so as to cast a shadow. Ranges can be had with either right or left hand ovens to accommodate a window at either side. It is never good practice to have a window behind one's back when cooking.

A meal must be prepared, served, and cleared away in the kitchen and this means a number of different functions

which must be planned for. In preparing a meal the dishes and cooking utensils should be stored near the range and the sink, to avoid taking unnecessary steps. There should be ample table or shelf room for use during the preparation of the meal, and after the food is prepared the next step should take it to the dining room without unnecessary labor. Usually a little careful planning will disclose an arrangement of food supply, range, and table that will permit the latter to be near the dining room end of the kitchen, so that in serving the path will be short and direct.

After the food is served and the meal is finished the travel, of course, will be in the opposite direction; the soiled dishes should end in a direct path from the dining room to the sink and there should be plenty of table or shelf capacity to stack up the dishes both before and after washing.

Next, comes the storage of dishes in a cabinet or dish closet where they will be ready for the next meal. The ideal location for this cabinet is close to the sink and near the dining room, so they will be close to the dining table when it comes time to serve the next meal. A very good way to accomplish this result is to locate the sink with its back against the dining room wall and place the china closet on the same wall, at one side of the sink. By having two sets of doors on the cupboard, one set opening into the kitchen and the other into the dining room, the *par excellence* of convenience is made possible. Then when the dishes are washed they are put in place directly in the cupboard, to be taken out again from the dining room side when wanted.

To know how much shelf room is required for dishes and cooking utensils it is only necessary to measure shelves with which you may be familiar and then compute how many feet of shelving will be required in the new home. A little experimenting will also determine how much table

space is required. Cooking utensils should, of course, be stored close to the range.

Whether to have the refrigerator directly in the kitchen or out in a pantry or entry is a debatable point. Convenience demands that it shall be placed directly in the room, but some housekeepers prefer to have it in a little entry just off the kitchen, so that the ice can be replenished without requiring the ice man to enter the kitchen. Also, it is the rule in some homes to keep the refrigerator in a cool pantry so as to make it unnecessary to purchase ice in winter.

A refrigerator can be built into the kitchen wall with its back opening into the entry when desired, thus permitting ice to be put in place from outside, or, it may be built into an outside wall where the ice man can get at it from outdoors.

A little shelf for cook books and a kitchen clock will be found extremely useful; a little soap cupboard built into the wall near the sink will be found very convenient. If there is to be a fireless cooker or if an electric plate warmer or any other electric cooking or heating devices are to be used, they should be carefully planned for.

A very useful kitchen convenience is an ironing board which folds up into a little cupboard in the wall; it is, of course, equipped with a plug for electric current. When a step ladder is required in the bungalow a space for it may be provided in the kitchen, and many housekeepers appreciate the convenience of a cupboard for table leaves.

In some homes the idea of kitchen cupboards does not appeal to the housekeeper and for those who prefer a "pantry" there is a new idea which might be considered. This new storage space for food or dishes is called a "pantryette" and it consists of a small, shallow closet with two narrow doors which stand open during the preparation of a meal. Such a closet 3 feet wide and 2 feet deep when filled with shelves from top to bottom will be found ample

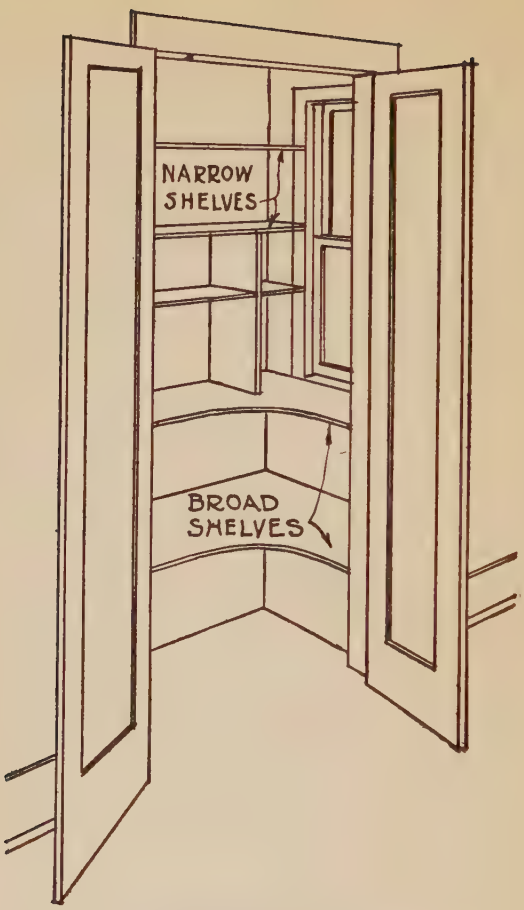


FIGURE XVIII.
A PANTRYETTE IN A MODERN BUNGALOW.

to store food for a considerable family. An enameled sifting flour bin can be placed on the lower shelf with a similar receptable for sugar. There should be a little window at one side or in the back.

A little breakfast space in an alcove off the kitchen will be found extremely convenient. It may contain a small table with a bench on each side and will prove a pleasant place to serve breakfast or luncheon and make much less work than when a meal is served in the dining room.

Manufacturers of enameled steel kitchen cabinets have brought out many excellent designs of cabinets and tables which will fit into almost any kitchen. In a new bungalow, of course, one can plan the space for these cabinets so that they will fit in perfectly upon the completion of the building.

A typical modern kitchen cabinet is in white enamel, inside as well as outside, and it contains ample space for cooking utensils, flour, sugar, spices, extracts, and a considerable amount of food supplies. There are drawers for kitchen cutlery and linen and the enameled metal table top slides out when required for a full size table.

Enameled steel kitchen cabinets often come in units, one consisting of a base containing a cupboard and drawers with an upper unit consisting of a cupboard with shelves arranged in several compartments. Many of these cabinets can be placed in different ways to occupy any desired amount of space. In some bungalow kitchens they are arranged in an alcove together with the kitchen sink, kitchen range, and the refrigerator to form a "buffet kitchen"; if doors are hung on the alcove containing this working end of the kitchen the space can be closed off when the work is done, thus making of the balance of the kitchen a sitting room.

There should be a chair or two in the kitchen and a stool for use at the sink, the latter to be pushed under the sink

when not in use. The chairs will require some wall space or they may be placed at the table. Another piece of furniture which it may be well to plan for is the serving table on wheels. If you are intending to use one in your bungalow, plan a space for it to stand when not in use.

Birch is an excellent wood to use for kitchen woodwork and doors, and a maple floor is considered ideal. The birch trim can be finished "natural" or it may be painted with white enamel; the maple floor can be oiled or varnished or it may be covered with linoleum, rubber tile, or cork carpet. Tile walls are very practicable for kitchens and the floor may be tiled also, but in the latter case rubber mats or thick rugs should be used in front of the sink and at the table and other places where it is necessary to stand, as tile is very hard and tiring underfoot. Composition or plastic floors are also practicable for kitchens and pantries. They consist of cement composition which is laid over the rough wooden floor and hardens forming a perfect surface upon which to stand or walk.

Undoubtedly the best place for the laundry is on the first floor in a separate wing off the kitchen. Here, light and air are ideal and it would be but a step to the clothes-yard. Unfortunately, in most bungalows it is necessary to build the laundry in the basement. Such an installation need not be inconvenient when one arranges the room carefully to accomplish the result desired.

The most economical place for the basement laundry is directly underneath the kitchen, so that the tubs can be connected with the kitchen plumbing and they will not necessitate a separate plumbing stack. A corner room is best because it makes cross draft possible and permits windows on two sides of the room. Most basement rooms are below the level of the ground necessitating small basement windows, but in the laundry it is better practice to have full size double-hung windows as large as those in the build-

ing above ground. This can be accomplished by building areas (little walls) around the windows so that the window sills may extend down below the level of the yard. In this way the light will be much more extensive and the laundry will be cool and comfortable at all times.

The present practice is to stand the laundry tubs out away from the wall, so as to make it possible to keep the floor clean behind the tubs as well as in front of them. At the same time when tubs are away from the wall a washing machine can be backed up to any one of the tubs, so that clothes can be wrung from the machine into any tub with least effort.

A laundry should have a cement floor pitching slightly toward a floor drain and the latter should be located near the tubs, as this is the place where most of the slopping occurs. The same floor drain will answer for the washing machine (or another may be provided). In any event there should be a floor drain for the washing machine, so it will be easy to empty the machine by pulling out the plug and allowing its contents to drip into the drain.

When making plans for the bungalow one should lay out all the laundry apparatus, so that it will be planned for before the building is completed. In addition to the laundry tubs and washing machine there should be a good, well lighted space for the ironing board and (when stove-heated irons are used) the laundry stove. A little careful consideration of the problem will enable anyone to arrange the fixtures of the laundry so that the path from place to place will be short and direct.

A laundry cupboard will be required for storing soap; many housekeepers when the room is large enough use the laundry for hanging up clothes in wet weather.

Laundry clothes dryers are excellent for any bungalow. They consist of metal compartments or drawers (like a

huge vertical filing cabinet) which slide into a metal cabinet warmed by electricity, gas, or coal.

The mangle for ironing flat pieces is also a useful adjunct to the laundry. It consists of a large metal roller heated by gas or electricity and operated in such a manner that flat pieces are "ironed" quickly and with little labor. Find a good, well lighted location for the mangle, so that this important part of the laundry work may be accomplished with least effort.

Electrical apparatus for the kitchen and laundry is described in detail in another chapter.

CHAPTER 14

HINTS ON ACCESSORIES FOR THE BUNGALOW

WHILE his factory is being built a wise manufacturer considers the machinery to be employed, its disposition in the building, and the uses to which it is to be put. Before the bungalow is completed your skill, energy, and good judgment must be applied to the problem of operation. Every family has a right to expect the efficient administration of household affairs. Every member of it looks to the housekeeper to organize and maintain the different departments of the home so that the machinery of housekeeping will give to each a maximum of service.

Successful housekeeping isn't a matter of luck so much as judgment. Correct apparatus, right utensils, efficient labor, and skillful organization will keep the household machinery running smoothly. Some mechanical contrivances aid the housekeeper though many do not.

Dumb Waiter

In some bungalows a dumb waiter connecting kitchen and cellar will be found very useful as it saves carrying burdens down over the stairs. At preserving time jars of fruit and vegetables may be stacked on the shelves of the lift and sent into the store room without effort. Coal and wood are lifted from the cellar by a woman quite as easily as by a man. Food supplies stored in the cellar cold-closet, laundry utensils, soiled and clean clothes (if one has a basement

laundry), and countless other things ordinarily carried up and down stairs by tired women are easily handled with a dumb waiter.

You may have the apparatus built or buy one ready-made. The lift is simply a box with interior shelves, sliding in a vertical runway. With two hardwood guides on one side and one on the other and a cast iron pulley at the top with a counterbalancing weight at the side, you will have a practical, cheap dumb waiter.

The weight for counterbalancing slides between two guides, and serves to balance the load so it may be moved without effort.

Ventilating Devices

Ventilating sash locks will be found very useful. One of the best models consists of a spring-pin fastened to the lower sash; the pin slides in a notched metal grove applied to the upper sash. With this device a window may be opened as desired, top or bottom (or both) and no one outside can force it wider open. Thus, with the windows open five or six inches the house is safe from invasion. To open a window wide the pin is released, but this can be done only from *inside*. Such a contrivance is especially useful for bedroom windows, which may be opened top and bottom for ventilation and yet remain secure from outside.

Another hardware appliance of little cost but much usefulness is a ventilator applied to the lower rail of the sash. A small slot is cut in the sash and the ventilator screwed in place. On the inside a little half cylinder of metal is pivoted. With a twist of the fingers the aperture is opened and fresh air admitted *through the top* without creating a draft. This device is useful in living rooms where outside air without drafts is needed in cold weather.

Window Devices

To correct the annoyance of rattling windows caused by shrunken sash shaking in their loose grooves an ingenious spring-metal device has been made. It is screwed to the side rail of a sash and springs against the stop, thus preventing vibration. A hairpin or match jammed into the groove will do the same thing, but such methods are not to be commended.

For your window curtains do not use a complicated rod holder. Pick out a simple pattern, easily applied; one that is durable and attractive. Rod holders stamped out of sheet metal are the cheapest and may be readily found in the stores. Get a holder that will release the rod as well as *hold* it. If you have ever bruised your fingers trying to remove an obstinate curtain rod you will appreciate more practical models.

Door Mats

Even the humble door mat should be wisely chosen, for it will be a source of considerable annoyance, or an article of great comfort, according to the degree of intelligence displayed in selecting it. The work expected of a door mat is that it shall hold dirt for a time and release it when the mat is cleaned. It must also wear well and look neat enough to deserve a place at the front entrance.

Galvanized metal door mats are always advisable. They allow one's shoes to be effectively scraped, holding the dirt until the mat is cleaned, but in selecting a metal door mat do not buy one with the mesh too small. Finely woven wire in cold weather fills with ice, making a mat slippery. The most practical door mats are those consisting of metal bar gratings which may be rolled up like a rug. They are easy to handle and the rolling process dislodges dirt without effort.

Hanging Pictures

The way pictures are hung adds to or detracts from the orderly appearance of rooms. Frames askew or tilted out too much at the top do not look well. An excellent device for hanging pictures consists of a little metal hook with a sharp, steel pin at the back. This pin is at an angle so that when pressure is applied it easily enters the plastered wall, drawing the hook up tight. Heavy pictures may be safely hung in this way and they will rest close against the wall. For lighter pictures the little glass covered steel pins are sufficient.

Flower Boxes

Flowers are just as much needed in the house as pictures, and some of the new flower boxes have cut in two the labor necessary to keep them watered. A self-watering box of galvanized iron is especially useful. This has an inner bottom, raised a few inches. A filling tube extends to the top of the box. Sponges are placed in the holes in the bottom. The box is filled with earth like any other, but water is poured down the filling tube until the reservoir at the bottom is full. From this reservoir sponges draw moisture and saturate the earth. Such a box will go many days without replenishing. In a box of this sort it is a good thing to keep a few pieces of charcoal immersed in the reservoir to sweeten the water.

Telephones

Years ago the convenience of speaking tubes was discovered. Frequently a house had its kitchen and at least one bedroom upstairs connected conversationally. At that time a "whistle" on the end of the tube was thought quite sufficient to give Bridget warning that the house mistress

desired a little conversation with her. After that time electric bells crowded out whistles and Bridget was called by a ring; now she steps to the 'phone right at her elbow in the kitchen and takes orders from almost any room in the house. This is not so necessary in a one-story bungalow as it is in one having rooms upstairs.

To one who lives without a house telephone it is hard to realize what a great convenience it is. With a 'phone system installed, Madam, before rising, may reach out to the table at her bedside and tell Mary in the kitchen what she wants for breakfast. If it is wash-day she might call up the laundress in the basement, following this conversation with an order or two to John in the garage—all in the space of a few minutes and with no more effort on her part than pushing a button.

Then there are so many other uses for inter-communicating house telephones. At her bedside an invalid can hold a conversation with friends calling downstairs when it is inconvenient to receive a personal visit. An ill child quarantined in the nursery can talk to other parts of the house—in fact there are so many step-saving uses for the modern house telephone that they are almost too numerous to mention.

Contrary to the opinion of some who live in small houses, it isn't merely big establishments which benefit most by the introduction of the house telephone. Little houses have found them of great utility and the mistress of a $3000 establishment is quite as convinced of the efficiency of a house telephone and the saving of steps it accomplishes as is the owner of a $30,000 house. Equipment for a bungalow is practically the same as for a larger house except that in a bungalow there may be only two stations whereas in the large house there might be ten.

It has been found that when a telephone system is arranged in a certain way, it costs but a trifle more than the

ordinary electric bell system always incorporated in the modern house. In other words, by paying a little more one can get the ordinary bell system (front door bell, rear door bell, and dining room buzzer) *with two telephones besides,* for very little more than the cost of the bell system alone.

The way it can be brought about is thus: the same wires that connect your dining room push button, front and rear entrance bells can be utilized for the telephone instruments. At stations where telephones are required a little metal box is placed in the wall (the same size and shape as the boxes used for ordinary switches). Each box contains all the apparatus necessary for talking and hearing with the exception of the receiver and transmitter (which is usually a separate little handle containing a transmitter at one end and receiver at the other). You talk in one end and listen at the other (as with English telephones); the instrument hangs on a hook beside the metal box when not in use.

Of course, there are more expensive and better house telephone systems than this—systems in which the conversation between two stations cannot be overheard at any other stations. In fact, house telephones can be divided into two classes—those in which your conversation can be overheard at any station and those in which every conversation is private between two stations. The former type is least expensive and the latter, most costly.

There are three general kinds of house telephone instruments—wall 'phones, desk (or table) 'phones, and hand 'phones (the last being the simple type first mentioned above as connected to the electric bell system). Of course, there are many patterns of each kind.

With only two stations on the line one instrument is usually placed in the kitchen or rear hall (next to the kitchen door) and the other goes in the principal bedroom upstairs or in the hall nearby. Often, the kitchen 'phone is

a wall 'phone, though when there is a kitchen table handy the table type may be more convenient.

For bedrooms a small table placed beside the bed is ideal. On this stands the table telephone, a neat looking little instrument well within reach.

For ideal home convenience, of course, there should be more than two stations. Added to the two already mentioned you should have a wall 'phone in the laundry, one in each servant's bedroom, one in the attic, another in the garage, and a telephone in an inconspicuous place in the hall, downstairs. Often this downstairs 'phone (which is for general family use) is placed on the library table. For those who desire it a table connection can be provided in the dining room and it forms an excellent means of talking with the maid in the kitchen.

Most architects when planning a house give special attention to the convenient location of the town telephone as well as house 'phones. In order that the electricians may know precisely where stations are, they are usually carefully marked upon the plans. A very good place for the general second story station is on the wall in the upper hall. This station, of course, is usually in addition to a station mentioned in the principal bedroom. Frequently wall or table stations are provided in guest rooms and often in the nursery. In the latter case a wall 'phone is more practicable, as children are apt to tip over a table 'phone.

For a private conversation downstairs a coat closet is often utilized for the town 'phone as well as the house phone. Both can be wall 'phones set low down for a sitting conversation, or table 'phones may be used.

At places where the mistress expects to use the 'phone herself, table 'phones are much more comfortable and should be installed by all means. Where room is scant, however (as in a narrow corridor), wall 'phones are more practicable.

Hardware

The wisest thing to do when buying hardware is to go to a dealer of unwavering reputation for honesty; one who will give you exactly the quality you are paying for. If you simply peddle your building plans out amongst dealers indiscriminately and allow unknown men to bid on the work, you may not be sure that the lowest bidder is intending to give you the same high quality the other dealers have figured on.

Not only is it difficult to determine the difference between solid and plated goods, but it is also extremely hard to recognize the different points in construction, the difference between cheap methods and good methods, the variation in the number of tumblers in a lock, and the weight of metal in a hinge. Hardware dealers know all about these points. They can tell by superficial examination of a piece of hardware just how it is built and what it is worth, but to the average house owner it is all Greek. He is entirely out of his element when it comes to judgment in selecting hardware, so he must depend principally upon the knowledge his architect has and the honesty of his dealer.

Do not forget that a lock is primarily to guard you from the invasion of outsiders. It must, however, yield to your key. In other words, a lock must let you in but keep the other fellow out; a poorly designed lock often fails in both particulars. Beginning with outside door locks, which are the most important items of hardware in the house since they stand for your protection, it pays to buy locks of the best construction and most invulnerable design. A good lock of this type is made of cold rolled steel with bronze bolt heads and keys of forged steel. The best of this kind have a compensating hub which allows for side adjustment whenever the door shrinks or swells, as it is very apt to do.

Other necessary points in a good front door lock are the separate cylinders containing the key hole and tumblers, (thus, the lock is called a "cylinder lock"); an "easy spring action" (secured by two springs, one of which works on the latch bolt, and both on the knob); a cylinder screw device to prevent the cylinder from being detached from outside, and a dead bolt for use in the day time when the cylinder "night latch" is off.

The old-fashioned way of attaching a knob to the spindle which operates the latch was to stick the square spindle through a square hole in the knob. These knobs quickly got loose and it was difficult to keep them tight. To get better results than this use hardware with more modern spindles threaded to receive the knobs, or spindles which are made of three wedge-shaped pieces, driven tight together with set screws. Thus, you will avoid the annoyance of loose, rattling knobs.

In selecting butts (hinges) for the front door pick out heavy cast brass butts, allowing three butts to the door. For inside doors cast steel butts plated with brass or bronze may be used, but plated butts will not stand the weather at outside entrances as steel soon rusts when exposed. Butts for doors are usually either loose pin or loose joint, so that the door may be conveniently attached after the butt has been screwed on.

Manufacturers of recent years have shown good taste in designs for hardware. It is now easy to get good styles where formerly good-taste hardware was practically unknown. You may find at any dealer's every sort of design, from the most ornate to the more simple. Simple patterns not only wear best but look best.

When selecting hardware to trim a bungalow, pick out goods with as little metal as possible. Large plates are never so pretty as small plates. Pick out the smallest sizes that will do the work and have the patterns as simple as

may be. Wrought brass escutcheons will wear just as well as solid cast metal, and they are cheaper.

The finish to be employed on a front door set should be one that will stand the weather without corrosion. Dark antique bronze is a good finish for outside work. Light lemon or brush-brass is also effective, though it grows darker after exposure. Dull black on steel is an excellent finish for inside use. It should never be used outdoors, however, as the steel underneath is attacked by moisture and soon shows signs of rust.

Garbage Receptacles

One excellent model consists of a steel receptacle with a cover, let into the ground. The garbage pail is kept inside, with the cover level with the surface of the ground. It looks like a coal-hole cover. To put garbage in, press the lever with your foot, which raises the small cover. To take garbage out, raise the large cover and empty the inside pail.

An above-ground garbage receptacle with a foot cover may stand behind a screen in the yard. Pressure of the foot raises the lid which drops back again when released.

A well kept back yard must be frequently picked up as leaves and bits of paper accumulate and must be burned. A wire crematory is best for burning rubbish. This is simply a wire barrel into which the rubbish is thrust and fired. The wire prevents hot particles from blowing about the yard; it holds the rubbish tight until it is entirely consumed.

For Drying Clothes you may use a lawn drier, which is taken indoors after the clothes are removed. Thus no clothes-posts lift their bleak outlines in the yard to mar its garden-like appearance.

Lawn driers are light, portable, square posts with wooden

yard arms strung with clothes line. The post is set into a little iron receptacle sunk into the lawn. When the arms are spread, enough line is exposed to take care of a large wash. Only one path is necessary to maintain in winter for a lawn drier. You stand in one spot to hang or gather clothes and the drier revolves, bringing every article within reach. An iron cover protects the receptacle when not in use. Store the drier itself in the cellar or shed.

If you still cling to clothes posts, build them of concrete and put them in an out-of-the-way corner. Concrete posts are cheap, attractive, and lasting. You may build the forms and mold them yourself, or finished posts may be bought from dealers.

Clothes Closets and Wardrobes

Surely no appurtenances of the bungalow are more important than storage places for clothes, and the modern home would be poorly considered unless closets and wardrobes were carefully designed.

The old-fashioned closet isn't the most economical place to hang clothes because, considering the number of garments that may be hung there as compared with the number of cubic feet contained in the closet, the cost is excessive. You can't hang clothes in the central part of a closet, because that is where you must stand when reaching for the garments.

In a wardrobe, however, which may be merely a built-in closet like any other except that it is wide and shallow, you may hang garments scientifically in a row on hangers without wasting any space. For instance, build in a closet two feet deep and four feet wide; hang double doors on it, so there will be no corners not reachable and you will find that a row of twenty-five or thirty hangers may be hung there. You couldn't possibly hang so many in a closet

three feet square though the latter would have nine square feet of space in it, whereas the wardrobe mentioned would contain but eight square feet of space.

To utilize the space high up in an old-fashioned closet get some hangers with long handles on them. These, you can lift up to hooks, above, without difficulty.

To equip your wardrobe you may get closet sets for the purpose, some of which consist of extension metal bars attached to the bottom of the shelf which slide out toward the room. Another way is to attach a long rod or curtain pole lengthwise of the broad side of the wardrobe (four feet long) and hook ordinary hangers over it.

Cupboards

For a bathroom cupboard you may use an ordinary wooden cupboard with a mirror door, placed over the wash bowl, or you can insert in the wall a white enameled steel cupboard with adjustable glass shelves. The latter type is most sanitary, as it is white enameled inside as well as outside and can be readily washed; the mirror forms the door.

For the kitchen one may also purchase cabinets or cupboards of wood or white enameled steel in a variety of forms to fit most requirements. Some of these are on the order of a "kitchen cabinet." Others are arranged for food or china, as desired.

One very convenient little cabinet can be attached to the inside of the kitchen door or in a space in the outside kitchen wall: it has two doors, one outside and one inside, and the milk man or grocery man can put milk or groceries in from the outside when the housekeeper is away, to be removed by the housekeeper, later, upon her return. Some of these handy devices are called "package receivers"; others are known as "wall receptacles." They are made of

metal and the inside door remains locked until unlocked by the housekeeper.

Coal Chute

Instead of putting an ordinary wooden coal window in the basement wall, through which coal is thrown to the coal bin, you can purchase a cast iron frame and door about the same size as the ordinary wooden cellar window. The door is glazed with heavy glass reinforced with wire (wire-glass), thus admitting light to the bin. Such a chute and frame should last infinitely longer than a wooden window, and it is apt to look better as time goes on because it is less likely to become bruised from rough handling.

Incinerator

For consuming garbage and waste paper you will find several designs of burners or "incinerators," any of which can be built into the chimney of the bungalow either during its construction or afterward. One of the most practical of these consists of a sort of small brick furnace built in the basement as part of the chimney, and extending up to the kitchen, above. An iron door in the kitchen wall admits to the brick flue and through this door can be thrown garbage, tin cans, and waste paper. When the flue is partially or completely filled the debris can be ignited through a door in the basement, and the contents burned.

For large bungalows a water heating garbage burner may be employed, containing a coal fire for warming the house supply and for burning garbage.

A more simple brick furnace can be constructed in the basement for burning garbage or waste paper; the base of the chimney slightly enlarged and containing a grate with an upper and lower door often proves sufficient.

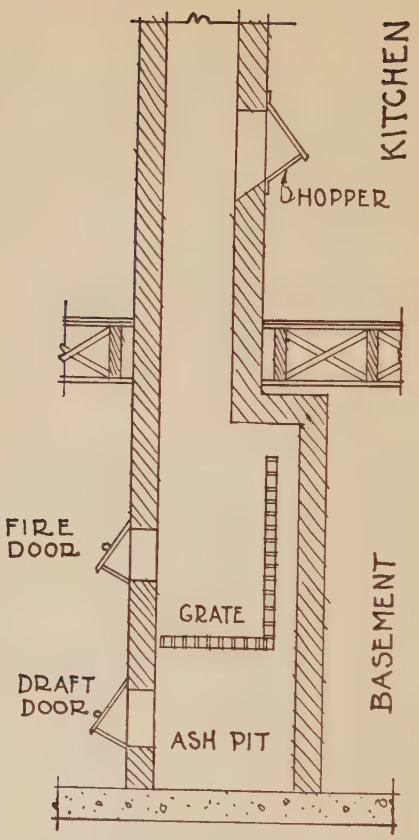


FIGURE XIX.
AN INCINERATOR WITH A HOPPER IN THE KITCHEN.

Wall Safe

For hiding small valuables such as rings and pins and for keeping a small amount of cash one may install in the new bungalow what is known as a "wall safe." These come in several sizes, one of the most popular being 4 inches deep and about 10 inches in diameter with a round door 6 inches in diameter. These little boxes are made of iron, steel, and asbestos and the door contains a combination lock. A wall safe can be built into an ordinary wooden wall but a better place is a brick wall such as a chimney where the door may be concealed behind a picture hanging on the wall. It will be found invaluable for securing jewelry from sneak thieves or protecting it from fire.

Radiator Covers

Who has not been annoyed by radiators and wished there could be some way to conceal them from view; what an annoyance it is to have dust on the wall above a radiator, requiring decorating so frequently! Radiator covers are designed to conceal or partly conceal radiators and to prevent the column of hot air which circulates above a hot water or steam radiator from staining the wall.

An ordinary wooden seat over a low radiator helps to cover it or a piece of marble cut to the right dimensions accomplishes the same result. Even a cushion set on a low radiator reduces the dust.

Then, there are more elaborate wooden cabinets with wooden grilles in front within which the radiator is placed. Some of these have cane fronts woven like cane-seat chairs. Metal radiator covers can be purchased in all sizes and in any finish.

In all cases, radiator covers should be so constructed that one may easily get at the radiator when repairs are needed, and one should remember that placing a cover over a

radiator somewhat reduces its heating value. For this reason covered radiators should be larger than would be necessary if they were to remain uncovered.

Metal Sash

Windows for the ordinary bungalow are usually of wood, but metal casement sash are coming into prominence because they are so much stronger than wooden sash. Casement windows hinged as they are like doors are subject to considerable wear and tear and to offset this, steel casement windows have been devised. These are not unlike the steel sash used in modern factory construction. Owing to the superior strength of steel over wood, steel sash can be made with much smaller members than wood sash. They are quite expensive, but excellent in appearance and very durable.

Wall Beds

The ever increasing problem of living in large cities where so many families must inhabit small areas has systematized modern apartment building and some of the inventions which prove useful in these apartments often prove successful in houses and bungalows.

The "wall bed" or folding built-in bed is now installed occasionally in bungalows when it is desired to utilize an ordinary living or dining room for a practicable bedroom. Most bungalows, of course, have regular bedrooms but often it is convenient to have an extra bed or two. Instead of building an extra bedroom or two for this purpose, you may install in another room a built-in bed which is concealed in the wall when not in use.

Thus, a living room or dining room becomes a bedroom when desired. Many designs of wall beds are pivoted on end in a doorway to open into a closet or dressing room;

when turned into the closet they are concealed by a door from the living room or dressing room. Other patterns fold up into the wall, and still other patterns fold up on end, after which they can be trundled into an ordinary closet on their own casters.

CHAPTER 15

ELECTRIC HOUSEKEEPING

HOUSEKEEPING is a business. It involves manufacturing, buying, selling, labor, and rent just as much as the shoe business or clothing business. Economy must be practiced and efficiency secured in order to pay dividends on the investment as in any mercantile concern.

Your manufacturer, if he is successful, is a careful, conservative business man who has figured out to a dollar just how much labor and material he can put into an article and sell it at a fair profit. His factory is organized for one result: the economical manufacture of goods.

First, cost of raw material enters into his problem. After that comes economical storage of goods and efficient application of labor to convert raw material into a manufactured article.

Why is it the modern factory is so fully equipped with the latest machinery? Because manufacturers have discovered that the biggest item in their factory expense is labor, and any machine that will make it possible to turn out more work at the same price or the same work at less price is a necessary unit in the chain of manufacturing equipment.

Your kitchen is your factory. It is the manufacturing end of your housekeeping plant and should be as carefully planned and as efficiently equipped as any other factory. Labor, with proper modern machinery, accomplishes work with less effort, in less time. Your kitchen department will pay dividends by reduced expenditure and added comfort,

and you, your cook, or housemaid will be something more than a slave. Correct kitchen machinery actually facilitates work by saving of time and labor.

Many housekeepers are at first very skeptical of labor-saving devices. After years of work by hand, when the various tasks of housekeeping have become systematized into a daily routine, it is not strange that some housekeepers dislike to be disturbed by new methods. It sometimes seems appalling when you propose to install modern labor-saving devices which must be learned and mastered.

The first sewing machines were universally snubbed and it took so long to get the original carpet sweepers on the market that manufacturers all but gave it up in despair. Electricity has made possible a perfect system of housekeeping that could not be secured by other means. A few feet of wire plugged into an ordinary electric light socket may be the means whereby wheels turn, the kettle boils, the oven is warmed, a room is lighted and heated, and an entire house cleaned. Instead of muscles, brains are used, and you direct the apparatus which does the work.

The Electric Kitchen Cabinet is one of the newest labor-saving devices and it is quite the cleverest piece of apparatus imaginable. In size and appearance it is like any kitchen cabinet, but where the ordinary cabinet is lifeless this one is very much alive.

Overhead are the usual cupboards for dishes, drawers for spices, and a flour bin with a sifter. On the table top is mounted the little machine which accomplishes much of the work usually done by hand. This is nothing but a revolving shaft enclosed in a casing, receiving power from a small motor. To connect with the shaft are all the tools one can think of required in preparing and mixing food: a bread mixer, cake mixer, meat chopper, potato slicer, ice cream freezer, cherry stoner, egg beater, coffee grinder or knife sharpener may be snapped into place two at a time

(one at each end), so that two operations may go on at the same time and with the same amount of electric current. Underneath the cabinet the various tools may be kept, each to be withdrawn and set to work in the fraction of a minute. Anyone who can turn a button is able to operate a machine of this sort. Everything about it is automatic; in fact, it is not nearly so complicated as a sewing-machine.

The Electric Range is a marvel of complete arrangement for economical and convenient cooking. It looks like a gas range and is about the same size, but unlike the gas range you do not have to connect it with a flue. It stands against the kitchen wall anywhere and is connected by a flexible wire cord attached to a floor or wall plug.

Electric heating and cooking devices consist primarily of coils of wire or plates of mica and metal which offer resistance to the current. This resistance of the electric current causes the coils or plates to become red-hot or white-hot according to the amount of current used.

The chief advantage of electric cooking is the convenience of securing heat by merely snapping a button, and the chief economy is in the fact that the current may be instantly stopped when cooking is accomplished. Of course, the gas range has practically the same advantages, but electricity is an improvement over gas in the matter of fumes and odor. There are no products of combustion with an electric range—no fumes or odors. Also, the heat is more thoroughly localized in ranges of the best model, so that the temperature of the kitchen is not appreciably raised. In hot weather this is of particular advantage, and such a kitchen may be built smaller with perfect freedom from undue heat.

You will find that your electric range will do all the work of the best gas or coal range. Any temperature may be maintained by manipulating the various buttons and turning on more or less current as more or less heat is

required. Three different temperatures or "heats" may be used in any portion of the range. You may bake, boil, fry, broil, simmer, or steam just as you can on the ordinary range, and the result is quite as efficient.

In the better class of electric ranges the ovens are insulated with about 1½ inches of refrigerator insulation, which greatly conserves the heat and thus reduces the amount of current consumed.

Special ranges are made on the fireless cooker order, with insulated ovens that will retain the heat from thirty minutes to two hours after the current is turned off.

Automatic electric ranges may be purchased with a clock attachment making it possible for the housekeeper to prepare the food, place it in the oven, and set the standard alarm clock for the hour she wishes the cooking to start. She turns the hand of the heat indicator to the correct temperature and can then go away and forget about it with the assurance that the meal will be cooked just right when she returns. The better patterns of ranges are of white enamel and they are marvels of convenience and efficiency.

The electric fireless cooker has a clock which can be set for a few minutes of current after which the clock switch automatically turns off the 660-watt heater and turns on the 40-watt heater. Cooking proceeds at the proper cooking temperature, although merely the 40-watt heater is in operation.

To keep plates warm while a meal is being served you may have an electric plate warmer in the pantry. They are as economical in operation as any other kind.

A Portable Oven is sometimes used as an auxiliary to the range. It stands in a handy location anywhere, on the kitchen table or pantry shelf. By connecting the cord with a lighting socket you have added another baking unit to your kitchen outfit. Many begin their electric cooking

installations by adding an electric portable oven as an auxiliary to the gas range. It can then be decided whether to abandon gas cooking entirely or simply to use electricity for supplementary cooking.

Electric Toasters are universally used, for they seem to provide the only practical means for making fresh toast just at the time it is wanted. Bread, toasted and allowed to stand even a short time, gets hard and dry. To overcome this well known fact the electric toaster is designed to stand directly on the breakfast table where the mistress toasts bread piece by piece as wanted. One very good combination toaster and griddle consists of a little electric stove with handles, standing on a tray. Above the stove is a rack to hold slices of bread or to keep plates warm. Bread is toasted on the stove. When griddle cakes are desired the tray is placed on the stove and used as a griddle-iron. All these operations may be accomplished directly on the breakfast table, or in the pantry or kitchen.

To warm the kitchen when there is no coal range for that purpose (or to warm the bathroom) you may use an *electric wall heater* which looks like a register; there are also *electric radiators* for various warming purposes.

Coffee Percolators make excellent coffee right on the breakfast table. A cord extended up to the electric light fixture over the table is all that is necessary, and the current may be snapped on or off at will. Pretty little *tea kettles* of two pints' to three pints' capacity may stand on the table or on the broad shelf in the pantry. They are economical, efficient, and very attractive in appearance. A small perforated basket may be bought with the tea kettle in which to boil eggs. In the sick room an electric tea kettle is of great practical use; for the "afternoon tea" it is very convenient.

Separate little *portable stoves* or "hot plates" are useful for a variety of purposes. Anything from a chafing dish

lunch to a complete meal may be cooked on them, quickly and satisfactorily, in the dining room, kitchen, pantry, or bedroom. All that is needed is an electric light fixture and a few feet of cord.

Electric Chafing Dishes are mounted on their own stands equipped with three heats—low, medium, and high. They look very much like any chafing dish, except that the alcohol flame is missing. Manufacturers of electric cooking apparatus have been quick to realize the market for chafing dishes and their designs are particularly pleasing, prettier if anything than the ordinary.

Electric Dishwashers have done much to lighten the burdens of the housekeeper. No matter how much women may delight in cooking, very few of them enjoy the drudgery of washing dishes and to these the electric dishwasher is a boon.

The table type of dishwasher is a little cabinet on legs which may stand anywhere in the kitchen or at the side of the sink. In many installations the dishwasher occupies the space usually taken up by the drain board. The dish washer is connected with hot and cold water and it drains into the plumbing stack in the same manner as the kitchen sink.

Most dishwashers operate on the centrifugal principle by means of a motor with revolving blades (propeller style) which agitates the hot water and dashes it over the pile of dishes stacked in the cabinet to be washed.

Other models of dishwashers consist of small machines not unlike electric clothes washers. Dishes may be put into the washer, the current turned on, and by the time the dining room is put in order the dishes are washed clean, ready to put away in the cupboard. When washed in scalding water, the heat dries them automatically and they do not require handling. A batch of dishes can be washed, rinsed, and dried in about eight minutes.

The Electric Sewing Machine is among other electric conveniences now considered as standard for the average household. Portable machines are about the size of a typewriter; they are kept in a closet when not in use and when wanted they can be set upon an ordinary table, connected with a light socket, and are then ready for use. Other styles are like ordinary cabinet sewing machines with a direct connected motor. Ordinary foot-power machines can be converted into electric machines by adding an electric motor attachment with a foot-pedal switch.

The Electric Phonograph is an important innovation for those who enjoy this universal household instrument and wish to avoid the annoyance of winding up a clock-work motor. Ordinary phonographs can be easily converted into electrics by adding a little motor manufactured for the purpose and connected to the record table by means of a belt.

Electric Refrigerating Machines are automatic, efficient, and very convenient. Many bungalows are now provided with electrical refrigeration, as the installation is comparatively simple and operation is practically automatic, requiring but little attention on the part of the householder.

Some patterns of refrigerating machines are placed in the basement under or near the refrigerator; a circulating line of brine pipe extends up to a coil in the refrigerator and thence back to the machine. An electric pump automatically circulates ammonia or other volatile liquid, which reduces the temperature of the refrigerator to about the same temperature as an ice-cooled refrigerator.

Other types of machine can be mounted directly on top of the refrigerator; the best designs have a small space between the refrigerating coils where little cubes of ice can be frozen for table use. It is also possible to have an ice cream freezer attachment.

Electric Heating Plants, as suggested in another chapter, can be installed in bungalows or more pretentious

homes, but they are not by any means universal. Electric burners can be attached to an ordinary furnace, or a hot water or steam boiler and be equipped with an electric furnace for heating purposes, but the cost of current is prohibitive in most places. The convenience of an electric heating system, of course, is undebatable.

Smaller Electric Devices for ordinary household purposes such as curling irons, heating pads, heating rods, and electric fans are so universally found in all homes, now, that they need no mention here. Even baby has thoughtfully been provided with a cup in which his milk can be warmed by merely pressing the button.

A Hot Water Heating Faucet has been developed which is extremely convenient when one does not need too copious a supply of hot water. The device is attached at the kitchen sink, where it takes the place of the ordinary hot water faucet. When water is turned on, slowly, the current automatically heats the water.

Electric Cleaning is not the least important part of electric housekeeping and thousands of housekeepers are taking advantage of the new, sanitary methods for housecleaning. The new way is to *keep clean* (after rooms have once been thoroughly cleaned) by frequent use of a vacuum cleaner.

The first time an electric vacuum cleaner is operated in a house the labor is almost as great as by hand-labor, for no matter how particular the housekeeper may have been the house gathers dirt on walls and in odd corners and out of the way places. The most rigid hand-cleaning will not remove this dirt, which may not be noticeable but exists nevertheless. When a vacuum cleaner enters the field this left-over dirt is all removed. *After the house is once clean* your vacuum cleaner keeps it so with little effort. That is the secret of vacuum cleaning. You don't allow dirt to accumulate, for it is easier to *keep* it from gathering than to *clean* it out once it gets in.

Vacuum cleaning does to the house what the Turkish bath does for the human body. It removes all the dirt, and once out it is easy to keep clean. No modern housekeeping apparatus is more universally useful than the electric cleaner.

Permanent electric vacuum cleaning plants may be installed in the basement of a house at a moderate price. Such a machine properly constructed is very nearly noiseless in operation, and entirely automatic. A turn of the switch upstairs starts it going or stops it, and the only attention required is an occasional oiling, and emptying of the receptacle containing the sweepings. One pipe in the wall extends up through the center of the house from cellar to attic, and a valve is inserted at each floor. To this valve you attach the hose, which is long enough to reach any of the rooms.

Portable electric cleaners are sold by thousands. They are practical and useful.

An Electric Laundry is equipped with an electric washing machine, which washes the clothes much better and quicker than by hand, and an electric mangle for ironing all flat pieces. Electric flatirons like ordinary irons are used for all ironing purposes. The hot water boiler in either kitchen or laundry is connected with the furnace in the winter, like any other boiler, but in hot weather you may snap the switch of your electric heater attached and heat the water that way.

What Is the Cost of Electric Apparatus? The first cost is usually slightly more than for similar apparatus using gas, though in some instances the cost is the same. With current at 8 cents to 12 cents per K.W. electricity is an economical heating agent. For instance, you may boil a good sized kettle of water in 12 minutes at a cost of about $1\frac{1}{4}$ cents. It costs $\frac{1}{2}$ cent to boil 1 quart of water, and takes 7 minutes. Beginning with cold water, your percolator full of coffee costs you $1\frac{1}{8}$ cents for the heat to

make it. It costs from ⅔ cents to 1½ cents to use the chafing dish and your entire electric range may cost as little as $6.00 per month for cooking the meals of a family of four. Of course, economy in using electric apparatus depends upon the efficiency of the cook. If you don't turn off the switch your electric apparatus keeps on using current, but when you use current only as it is required, electric cooking, heating, washing, ironing, and cleaning will prove economical, efficient, convenient, and entirely satisfactory.

CHAPTER 16

EXTERIOR PAINTING FOR OLD OR NEW BUNGALOWS

THERE are so many mistaken ideas about paint and stain that we would like to discuss in a few lines some of the practical side of painting, with the promise that the case will be stated in the simplest possible language so that readers will not be bored by a merely technical discussion.

In the first place, paint, however carefully it may be selected and with whatever fidelity it is applied by mechanics, will not permanently cover up bad lumber and poor workmanship in the house structure. In other words, if the side walls of your building are covered with cheap siding containing knots, or if the edges of the window casings are bruised and scratched, you need not expect the painter to produce successful results.

So much trouble is caused by poor woodwork and siding underneath the paint that readers should be impressed with the necessity of insisting upon good, smooth wood trim for the exterior of the house. Also, it is necessary to watch the carpenters carefully to make sure that they do not drive unnecessary nails into the casing of the windows, making permanent scars that it will be difficult to conceal later on. Sometimes mechanics nail temporary boards over window and door openings, and, later, when the boards are taken off, splits, nail holes, and bruises are left on the casings impossible to hide with paint. Watch your window and

door frames carefully and you can to a large extent obviate this difficulty.

Chemically, the idea of painting the outside of a building is to *protect* the new woodwork with weather-resisting material. Of course, there is a secondary reason—that of decoration: we paint our houses to make them attractive. Primarily, however, paint or stain is used to prevent woodwork from decaying and you may rest assured that just so long as a frame house is kept well painted, for just that length of time will it remain in good repair. If, however, you permit paint to become dingy and worn to the point where the woodwork can be attacked by the weather your bungalow quickly deteriorates, so remember the "stitch in time."

Upon first looking into the paint situation, readers will find that there are what might be termed two "schools" of paint—those manufacturers making "lead and oil" paint and those making "zinc and oil" paint. However, the majority of paint experts agree that pure white lead and boiled linseed oil make good exterior paint, though many experienced painters now contend that lead and oil paint should have a certain percentage of zinc added to make the paint more durable.

In our own practice "lead and oil" paint is used for the first two coats, and for the third coat zinc is added to make the white paint "whiter." We think, also, that this gives better wearing qualities. As a matter of fact, this formula was suggested by a white lead manufacturer who would, if anything, be prejudiced against zinc.

These are the two important foundations for all exterior paint—white lead and oxide of zinc. With one or both of these materials, linseed oil is added to produce pure white paint. When colors are to be used the tints are obtained by mixing the color required with white lead (or zinc) and oil, and you should remember that the wearing qualities

of the paint come from the lead or zinc and not from the coloring material.

Next, after the reader has puzzled over the various advantages of lead and zinc, he will be required to settle whether he should use ready-mixed paint or paint mixed by his painter.

In our own practice we have obtained (sometimes) good and (sometimes) poor results with *ready-mixed* paint as well as paint *mixed-to-order*, so in our opinion the result resolves itself into the simple fact that *good paint is good whether ready-mixed or mixed-to-order*. In the same way, bad paint is bad, and the house owner's chief safeguard is to purchase standard goods of known reliability, whether he buys paint ready-mixed in cans or white lead, zinc, oil, and colors mixed by his painter.

Owners are sometimes influenced in the purchase of paint or paint ingredients by price, but economy in first cost is apt to be extravagance later, for you will usually find that a brand of white lead (for instance) costing a few cents per pound less than some other well known brand is inferior in quality. Possibly it has received less grinding, and frequently it contains a larger percentage of foreign matter. Then, of course, one can pay different prices for linseed oil, *boiled* oil being more expensive than *raw* oil but producing a better paint.

Houses finished with smooth siding such as wide boards or clapboards are usually painted, but houses covered with rough sawed siding such as shingles or rough boards, are usually stained. For ordinary smooth siding such as planed boards, clapboards, and the like, stain is not practicable because stain, a thin material, will not successfully tint smooth woodwork. For smooth siding and trim you should use paint to produce a (comparatively speaking) thick film of weather-resisting material on the outside of the boards, penetrating slightly into the fiber of the wood.

For rough boards, shingles, or any sawed surface (not planed) stain is the proper material, because it gives the woodwork a pleasing tint by penetrating deeply into the surface of the wood. The idea in stained surfaces is that the stain shall be so thin that it will penetrate. Such stains are technically known as "shingle stains" though, of course,

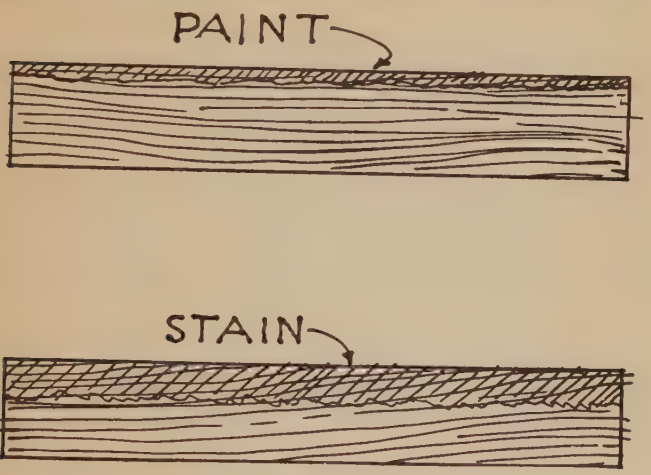


FIGURE XX.
DIAGRAM SHOWING DEGREES OF PENETRATION OF PAINT AND STAIN.

this material is applicable to any wood of rough surface whether boards or shingles.

Concerning the wearing qualities of stain the same general statement about paint is also applicable to shingle stain, except that the ingredients of shingle stain are somewhat different, as the process of staining is chemically different from the process of painting. Shingle stains of the better grades are composed of pungent oils mixed with color. Creosote, a well-known preservative, is used in many brands

of stain, though other stain manufacturers claim an equal preservation from the use of oils without creosote. To the novice buying shingle stain, we would advise selecting an advertised brand rather than an unknown brand, for it is almost impossible to be sure of reliable goods any other way. Very few painters know how to mix made-to-order shingle stain and most architects and builders now agree that *branded stains* only are safe to use.

For those who desire the pretty grey "weathered" effect which shingles on old houses have, "weathering oils" can be used consisting of chemical compounds which preserve shingles, causing them to quickly turn a beautiful grey. Manufacturers of shingle stain sell these oils. Of course, the houses of olden time now so grey were never stained by compounds, but it would be unwise now-a-days to omit the staining of shingles, because modern shingles are less durable than the clear white pine shingles which were obtainable forty years ago.

There are some simple rules to follow in painting a house. In the first place, the woodwork should be absolutely dry before the painter touches it with the first coat of paint. Naturally, for a good job you require that the paint shall soak into the wood as much as possible, but when the fiber of the wood is damp (containing water, in fact) the oil in paint will not strike in as it should. On the other hand, dry wood absorbs paint almost like a sponge —and that is what you want, though possibly your painter may not be so enthusiastic about it for this way uses up more paint.

One difficulty frequently found when painting a new house is that dust from newly made lawns (before grass has been planted) blows into the fresh paint, so that the house looks quite dingy even when new. This can be obviated by a little careful planning of your planting. For instance, when the siding is first applied to the house

you will, of course, want your painter to begin priming, though probably the new building site will not have been graded at this time. If the wind blows strongly during this process, it will be well to wet down the grounds with a hose to lay the dust.

Contrary to popular opinion this priming coat should be rather thin, containing a large percentage of oil, because it is desired that the first coat shall soak well into the wood, a result that cannot be obtained by thick paint. So if the bungalow does not look very "strongly" painted after the first coat, do not imagine that your painter is necessarily trying to slight his work.

After the first coat is thoroughly dry (usually some days later) it is ready for the second coat, which should be a little thicker than the first. The paint must be "brushed out," following the grain of the wood as much as possible, for if this second coat is too thick it is apt to form blisters which will cause trouble later.

It would be an excellent thing if the third coat could be kept off the building until all grading is finished and the lawn completed, but rarely is it possible to handle the matter this way. Usually about the time painters are finishing up with the third and last coat the grading department is busy spreading black earth for the grass, and in dry, windy weather black dust blows on the freshly painted surface of the house. Sometimes this result can be avoided by painting only in still weather; then again the dust may be laid by sprinkling with a hose.

When painting, don't forget the importance of puttying up all nail holes. This putty is applied on top of the priming coat of paint, as putty sticks only to painted surfaces and will not adhere to unpainted wood.

By selecting a standard brand of paint or stain, after having consulted with the painting experts about the color scheme, you are bound to get good results, provided you

select a reliable painter to do the work. In no branch of the building trade can work be slighted more easily without detection than in painting. It is sometimes impossible to detect a bad job of painting until after the work is entirely completed; then, frequently, poor work does not show up until months afterwards.

Nature has set the example for good color combinations and you can do no better than to follow this lead, remembering though, that Nature's colors are too vivid to copy exactly. When selecting a color scheme you should use tints more dull than those commonly found in Nature. For instance, greens, yellows, and browns are delightful combinations, but in your house painting you should not use so brilliant a shade of yellow as that found in "Golden Glow," nor would it be wise to employ such "lively" browns and greens as those found in our gardens. You may, however, use, for instance, golden-brown stain on the shingled walls of your bungalow combined with a moss-green roof. With this combination it would be pleasantly daring to use pale yellow panels on the shutters and front door, though the yellow should be so soft that it is almost grey.

The value of white paint and green blinds is so well understood that it is hardly necessary to mention here this popular combination, but occasionally owners paint houses white without using green blinds or shutters. Nothing is more ghastly than white paint when untrimmed with color, so do not paint your bungalow white unless you are willing to add green blinds or trellises to give "life" to the white side walls. Probably no paint in the world wears so well as pure white without any color added, and this may be the reason why the popularity of white houses is increasing.

In using green for shutters you will find that the old-fashioned New England "bronze green" is about the best and most durable color you can use. Upon examining this shade by itself you will be surprised to find that it looks

almost black, but when the shutters are hung the white paint seems to bring out the green. One reason for using very dark green is on account of its greater durability, for ordinary shades of green fade much more quickly.

Some house owners have good taste and others do not. Some seem to have a natural talent in the selection of colors, a sort of intuition of what is good and what is bad. To such people the selection of tints for inside and outside the house can be safely intrusted.

Unfortunately, many painters while very practical when it comes to mixing and applying pigments, have not a very good idea about harmonious color schemes. To them, *paint is paint.* A combination of colors which looks well on some houses they have seen appears to them correct for any other house.

The selection of colors is about the last thing required of the bungalow owner before the building is completed. His architect has an advantage over the owner in this regard, because usually architects have a definite idea of color from the start. Even when working plans are being drawn, most architects have a mental picture of the completed building: a picture showing the grounds all planted and the house painted throughout. Thus, there is a sort of cohesion of ideas of the entire scheme in the mind of the architect not always understood by the owner.

Linseed oil is pressed from flaxseed and may be pure or impure according to the care taken in its manufacture. Best linseed oil is placed in tanks and allowed to settle, only the pure oil being drawn from the top, the residue being discarded. The oil is also carefully filtered. Reliable manufacturers make good oil and good oil, only, so the best advice we can give to the property owner is, buy only from responsible and reliable manufacturers. Many of these now put oil up in sealed cans, in which case, of course, the buyer can always be sure of the material.

Chemists have been seeking for a substitute for linseed oil. Many claim they have found it. Some of these substitute oils are China wood oil, cotton seed oil, corn oil, and other vegetable oils. It might be safe to use these ingredients when guaranteed by reliable manufacturers, but unless they are, house owners had better stick to the more ordinary ingredients of old-fashioned paint.

After selecting your brand of paint consider the way it ought to be applied. In repainting a building undoubtedly the cause of many a poor job is the bad condition of the old paint. We will not attempt to state in months or years how frequently buildings should be repainted, because conditions of climate vary in every section of the country, but undoubtedly it pays to paint a building just as often as it needs painting. Every owner of property knows when his building needs painting, and it will pay him in dollars and cents to do it promptly before the paint is so badly worn as to give a bad surface underneath the new paint.

When old paint is in bad shape, it pays to burn or scrape off all loose particles before the new paint is applied. If a building is old and a great many coats of paint have been applied (during many years of painting), the new paint should be mixed extra thin, with plenty of oil. As a matter of fact, plenty of oil is a good thing to din into the ears of your painter, who may prefer less oil because thick paint spreads easier than thin paint. Thin paint with lots of oil can be used, however, if the painter brushes it out well, and that is what you want him to do—to brush it out over the old paint instead of slapping along, with the idea of saving on labor.

Price should not be the prime consideration in a painting job. The good workman who, to get a good job, works more slowly than a careless man costs more money in the beginning, but he proves cheaper in the end. Good, pure in-

gredients cost more per gallon, but they last many months longer than cheap, inferior goods. The next time you take bids on painting or the next time you buy paint for your own use, try specifying the most durable paint you can find regardless of price, and then have it put on right.

Plaster houses, or so-called "stucco" houses, do not usually need paint on the plaster surfaces, but as some bungalow owners prefer to paint their plaster buildings manufacturers make special paints for exterior plaster walls. Most of these paints are in the nature of stains which permeate the pores of plaster. The most pleasing of these tints are soft, pastel shades not too violent in color.

When it comes to a plaster house, unless the plaster is quite dark, white is not so good a pigment to employ as others. White does not give so good a contrast as light tan or some other "warm" color usually required to relieve the "cold" tone of plaster. White can be used with good effect, however, even on a house of plaster if green blinds are used to warm up the color scheme.

An excellent color for English timber-work bungalows is brown. Timbers used in old houses in England were usually uncolored, but years of wind and weather have given them a beautiful nut-brown tint that can be quite satisfactorily approximated in modern houses by using stain. When stain is used, however, woodwork will take the tint much more prettily and more permanently if rough-sawed timber is used (not planed smooth).

Combinations of shingle stain and plaster are always attractive. Plaster in itself is somewhat "rustic" in appearance and stain seems to have just the informal look that plaster needs. Brick is also frequently employed successfully with stained shingles and plaster, brown brick appearing unusually well with tan shingle stains. Care should always be taken to use but few colors in the color

scheme, otherwise the effect will be bewildering when it ought to be quiet and restful.

Grey stain is excellent for shingled houses, especially when there is plenty of shrubbery to lend color to the composition. White trimmings look well with grey stain for the latter soon grows dark, making a pleasing contrast with white. As a matter of fact, grey harmonizes with all colors, since grey is a "neutral" tint. For this reason it is safe to use in any color scheme.

So many beautiful shades of green come in every brand of shingle stain it is possible to get beautiful green effects.

CHAPTER 17

THE PRACTICAL SIDE OF INTERIOR DECORATION

IF your home is to be a charming one, the interior must be as tasteful as the exterior. Indeed, of the two evils, an ugly bungalow on the outside or one unattractive inside, the latter is probably the more offensive. We live *inside* our homes. All the little incidents of our daily routine take place there and our lives are more influenced by experiences inside the house than outside.

Nothing contributes more to the charm and satisfaction of life than to live in a home which reflects good taste in its interior furnishings. Nothing helps more to educate children to an understanding and appreciation of good taste than to bring them up in a home where good taste is evident.

Designers of women's gowns years ago discovered that Nature could supply them with more color schemes than they could use. From just the wings of a butterfly one can get *motifs* enough for a hundred gowns and every flower garden furnishes color and designs galore. Interior decorators have come to realize the fundamental truths of Nature and their work shows evidence of having gone to this source for their inspiration.

In studying natural color schemes from insects, birds, and flowers one should realize, however, that the colors of nature are much too vivid for the enclosed walls of a room. Out in the bright sunlight, with an absorbing and limitless sky above, colors in a flower garden are not

too violent in tone, but indoors our color scheme must be carried out in a more subdued fashion.

In using blue, green, brown, or scarlet indoors one must be careful to tone them down, using dull shades or the more delicate pastel shades instead of the stronger tones.

For treating the walls and ceilings of a bungalow there are many methods, beginning with the bare plaster left in its natural state with no tint of any sort, up to an elaborate scheme of hardwood paneling.

Considering, first, bare plaster—many builders recommend doing no decorating the first year so as to give the building time to settle and crack. Then, when the building is sufficiently dried out, they recommend fixing the cracks and proceeding with the decorating.

Whether this is advisable or not, the fact remains that a bungalow in which the plaster is kept in its natural state is extremely bleak and unpleasant. Plain, smooth plaster is almost deadly so far as decorative effect is considered, and one will find it difficult to get any charm in such a home.

Bare plaster can be used decoratively, however, when the walls are rough instead of smooth. This consists in using coarse sand in the last coat and then putting it on roughly to leave a grainy effect when finished. With strong color used on the woodwork of such rooms, and pretty curtains at the windows and rugs on the floor, the effect is quite the reverse of barren.

Many of the most successful bungalows have been finished in this fashion—rough plaster walls and ceilings with strong colored woodwork, curtains, rugs, and furniture. The rough plaster seems to act as a soft and pleasing foil for the strong colors contained in the furniture and fabrics.

Woodwork in such a room can be painted dull black or bronze green. Brown or lighter green are also good, and

SMALL SINGLE-STORY BUNGALOW WITH PLASTERED EXTERIOR.

A MORE PRETENTIOUS BRICK BUNGALOW TRIMMED WITH BEDFORD STONE.

coral-color has been used in similar rooms with charming effect.

The modern tendency in bungalows is to use less hardwood and more painted wood (soft wood) on the interior. The excellence of enamel paint which can be had in all shades has promoted the painting of interior trim and furniture, and hardwood is not used so much as formerly.

A good job of enameling can be done in four coats though, of course, another coat or two will greatly improve the wearing qualities of the paint. White is an excellent enamel for all-around use. There is nothing which looks so fresh, and white paint has the happy faculty of harmonizing with most colors. Most shades of wall paper or tint look well with white paint.

Enamel paint is the best to use because most durable. Applied in five or six coats, white enamel gives a wearing surface almost as firm as ivory. "White enamel" does not mean that the paint is necessarily glossy in appearance, for the last coat may be "egg shell"—which is really dull finish. Use only a reliable brand of enamel paint if you would avoid future paint troubles.

In planning the interior decorations for a bungalow it is a good idea to take the blueprints showing the floor plans and mark on each room a notation of the manner in which the room is to be decorated. Having in mind the general scheme for decorating the living room, for instance, make the memoranda "smooth plaster for wall paper"; "rough plaster ceiling for tint"; "trim and doors cream enamel"; "oak floors, dark stain."

In considering the details of decoration for a room the first problem that presents itself is the color of the trim and doors. When trim and doors are of hardwood one must consider the color of stain to be used (if the woodwork is not to be "natural") and then decide whether to finish the stained surfaces with varnish (glossy, or dull) or with

shellac or wax. Some stains have varnish mixed in them so that no further finish is required, but most stains are put on to give color and then one or more coats of varnish, shellac, or wax are added to the woodwork after the stain has dried, to give it a sort of half-gloss for preserving purposes. At the same time the gloss gives a firm finish which can be wiped off or dusted.

A durable finish for any stained woodwork is undoubtedly varnish, which covers the wood with a transparent skin, very tough and elastic. Any reliable brand is the right kind to use; look out for inferior varnishes made of poor gums, improperly mixed and sold at low prices.

The best kind of mahogany stain to use on interior trim is what is known as "dark" mahogany stain. This is about the color of the finest mahogany furniture and it is a good color to wear. Mahogany stain can be applied to mahogany or to birch. The latter does not appear precisely like real mahogany, but it looks very well.

Oak can be stained prettily in many different tones, from dark "antique" oak to light "fumed" oak. The tendency, however, is to treat oak in very light tones, as it has been found that light oak makes rooms more cheery than dark oak. When light, the treatment brings out the grain of the wood beautifully.

The pleasing appearance of a white-enameled dining room when mahogany furniture is used is well known. For an oak dining room, when oak furniture is used the trim should be finished to match the furniture.

In bedrooms, mahogany or birch-mahogany trim and doors can be used with mahogany furniture and brass beds, or white enamel paint may be employed.

Floors require special floor varnish, manufactured to give the greatest possible wear. Reliable brands of wax are also excellent for floors and trim. Varnish is not necessarily glossy, for there are many good brands of dull var-

nish which give that dull, satin-like effect so pretty inside the house. Dull varnish does not wear as well as glossy varnish, however, so glossy varnish is to be preferred so far as durability goes. On a very fine floor glossy varnish is often employed, consisting of several coats, each coat allowed to harden before the next is applied. Then the last coat is rubbed by hand, using pumice stone and oil (or water), which takes off the excessive gloss of the varnish and leaves it with a pleasing half-gloss, instead. Owing to the cost of labor required by the rubbing process, this is an expensive method of obtaining a "dull" finish.

For painted woodwork when enamel paint is to be used the underneath coats are usually of clear white lead and oil paint followed by a coat or two of enamel paint. If any tint off the white is wanted as, for instance, cream, ivory, yellow, French grey, or other soft shades, the tint desired is mixed with the last coat (or, sometimes, the last two coats).

Many bungalows are built in which the walls are covered with wall paper and the ceilings are tinted. For wall paper smooth plaster should be employed, but for ceilings which are to be tinted with "kalsomine" or similar "cold water" paint it is better to have the plaster finished with what is known as "sand" finish, consisting of coarse sand mixed in the last coat, leaving the ceiling with a rough, grainy surface. Tint will enter the pores of rough plaster and produce a soft, velvety effect very desirable. Tint on ordinary smooth plaster is dull and lifeless.

When papering a room for the first time it is a good idea to "line" the finished wall paper with a layer of paper, underneath. Any sort of cheap paper is used for this first application next to the new plaster, then when dry the finished wall paper is applied on top.

Wall paper comes with two plain edges beyond the pattern, like the selvage edge on cloth. In a good job of

papering these edges are cut away with a sharp knife so that the pattern on one strip comes up close to that on another. This is called a "butt joint" and is much to be preferred to a "lapped joint" in which the edge on one strip is lapped over the adjoining strip, producing a disagreeable seam which can be detected with the eye. On a good job of wall paper the strips are put on so cleverly that the pattern seems to be painted on the wall, no seams being discernible. To get this effect it is sometimes necessary to sandpaper the joints of paper to make them smooth and true.

When walls are to be tinted it is a good idea to give them a rough sand finish like the ceilings, for in no other manner will the tint look soft and pretty.

There are many brands of tint or cold-water paint to be had for tinting walls and ceilings. Plaster work usually requires to be sized with glue sizing, which, when applied, fills the pores of plaster. Then tint is applied in a single coat. Most of these tints are "water-color," and will spot easily, consequently they will wear but a few months when the rooms must be retinted. They are cheap, however, and many prefer to have the rooms re-decorated every spring or fall.

For more permanent color on walls and ceilings oil paint is used, consisting of a coat of sizing followed by one or two coats of oil paint.

Another method of decorating plaster walls and ceilings is to cover them with muslin and then paint the latter with several coats of oil paint. The muslin used is quite thin (technically called "canvas") and it is pasted to the plaster in strips like wall paper. When dry it adheres tightly to the plaster and gives a firm, durable surface to receive the paint.

When walls are canvased in this fashion they are frequently paneled by nailing small moldings upon them to

form panels, laid out in conventional rectangles. The canvased walls are then painted (often, white or cream) and the same tone is carried over the wood mouldings as well as the canvas, giving almost the effect of wood paneled walls.

This treatment of walls makes an excellent background for almost any type of decorative scheme. It produces a refined, quaint, and wholesome effect and pictures hang very well over such a background. At the same time furniture is set off in a very pleasing fashion.

Decorators usually recommend dark floors rather than light floors, as the former are less conspicuous than the "golden oak" floors with which we are so familiar. In some of the best bungalows oak floors are stained dark brown, and the effect is very successful.

Maple floors will not take an ordinary stain as the wood is so hard stain will not penetrate. They can be stained with dark, acid stain, however. As maple is used more for kitchens and bedrooms than for living and dining rooms, it is customary to have them "natural" or very light in color. Southern pine floors will take any color of stain from a deep, rich brown to a light "natural" tint.

The color of the staircase in a bungalow should receive special thought, as there are many ways to paint it. When the treads are of oak like the living room or hall floor they can be stained to match the latter. Many staircases, however, are built with maple treads and risers and in this case the treads can be stained to match the hall floor or both treads and risers may be painted the color of the trim. When a hall or living room is painted in white or cream enamel paint, it gives a very pretty effect to paint the stair treads and risers the same shade. The balusters can be painted, likewise, and the hand rail will be attractive when finished with mahogany or walnut stain.

Curtains and rugs belong to the decorative scheme, of

course, and should be carefully considered when the general plan of decorations is studied. Color schemes must be built around the rugs one intends to use, and curtain materials should be wisely chosen to blend harmoniously with the general plan.

The position of rugs on the floor gives one an opportunity to show good or poor taste. One large rug may be placed under the living room table and others may be smaller. To retain the pretty effect of an oak floor use rugs sparingly. Leave plenty of bare spots at the edge where there is not much wear. Put your rugs where persons will sit; at the piano, in front of the bookcase, or near the fireplace. Rugs are first of all to provide something more comfortable to stand upon than a bare floor and, secondly, to add decorative values to the room.

At windows, hang the kind of curtains you will be able to keep up with least effort, not the sort that will be a source of hard work. Buy durable materials in plain patterns. Most colors fade, but that is no reason for discarding colored materials. If the cost is slight and curtains are made in a simple way, you will feel like discarding them when they have become too badly worn. Curtains of raw silk are very pleasing and there are scores of desirable wool, linen, and cotton materials both plain and figured. Hang them simply on curtain rods with curtains extending down to the sill only. Do not put up fussy overcurtains. Make them with inconspicuous panels, looped or pleated, and you will find the living rooms more attractive, and housework will be greatly facilitated.

A good model specification for staining and varnishing is as follows:

Specifications for Stain and Varnish

The wood should be finished dry, smooth, and clean. Apply one coat of oil stain of shade selected and allow

to dry over night, then fill the wood with approved paste filler of color selected. After forty-eight hours apply one coat of pure shellac which, when dry, shall be lightly sanded; then apply two coats of approved varnish. Each coat shall be permitted to dry thoroughly, after which it is to be lightly sanded with No. 00 sandpaper. If a dull finish is wanted, rub the last coat with powdered pumice stone and oil (or water).

A cheaper way to get a dull finish is to use "flat varnish" for the final coat.

Specifications for Stain and Wax

After the wood has been stained it should be covered with one coat of pure shellac. When the latter is dry, apply one coat of wax and rub the same to a dull gloss.

Specifications for Varnished Floors

The wood should be dry, smooth, and clean. Fill the pores of the wood with paste filler and when dark floors are wanted apply a coat of stain of the right shade. Allow forty-eight hours for the filler to dry and then apply three coats of floor varnish.

The first coat should be thinned with pure turpentine, in the proportion of one pint of turpentine to one gallon of varnish. The second and third coats should be applied as it comes in the can. After each coat is thoroughly dry it should be sanded with No. 00 sandpaper. For floors requiring a dull finish, the last coat is rubbed with powdered pumice stone and oil (or water).

Specifications for Interior Enamel

All interior woodwork should be smooth, ready to receive the enamel.

Apply one coat of ordinary lead and oil paint and when

thoroughly dry, apply two coats of enamel undercoating, followed by two coats of enamel.

Each coat should be allowed to dry thoroughly and then it should be sanded with No. 00 sandpaper.

If a dull finish is required the last coat can be rubbed with pumice stone and oil (or water) or Egg-shell Enamel can be used instead. If the last coat is to be other than white, the required tint can be mixed with the white enamel to produce the desired shade.

On a very fine job use two extra coats of enamel.

CHAPTER 18

FURNITURE FOR THE BUNGALOW

THERE is so much furniture in the market that would be impracticable for the small rooms of the ordinary bungalow, the purchaser will be required to give a little careful study to the problem in order to understand the peculiar advantages and disadvantages the bungalow offers.

Pieces should be small as a general rule and the number of pieces required is usually less than in an ordinary house. Unfortunately there seems to be a tendency in bungalow furnishing, just as there is in the furnishing of more pretentious places, to fill rooms up with too much furniture. The result is a lack of harmony—an unrestful scheme that prevents a simple atmosphere which should be the charm of the tasteful bungalow.

The decorative scheme, of course, sets the key note for furniture. When the trim and general woodwork of a room are painted, either in enamel or ordinary paint, furniture may be more mixed in color and variety than if a room is finished in hardwood. For instance, if the woodwork and doors are white it will be found that mahogany, walnut, oak, or wicker of almost any kind or color may be successfully used for furniture, and the result may be quite charming and not the hodge-podge one might suppose. This is because white paint is a sort of neutral background that serves as a good foil for all colors.

On the other hand, if the doors and woodwork of a room

be of oak, it will be found that mahogany or walnut furniture does not as a rule look well and it is almost necessary to use oak furniture of the same tone as the woodwork. Wicker furniture of neutral tones such as natural, grey, or soft pastel shades may be successful in an oak room, but hardwoods other than oak are rarely successful.

The historic country houses and castles of rural England, Germany, and France, with their huge old halls filled with wonderful carved furniture probably suggested the styles that have in past years been so frequently used in American and European furniture design. The futility of copying heavy, hand-made pieces (successful enough in the environment of ancestral halls) and duplicating them for American homes is most apparent.

Machine-made furniture cannot duplicate hand-made furniture nor is it the wish that it should. Machine-made furniture when rightly designed is as durable and attractive as hand-made furniture, and a hundred times more fitting for the average American home.

Can one have furniture of good design and sound construction at moderate prices? This question may be answered positively in the affirmative. So much good furniture is in the stock of dealers and manufacturers it is the easiest thing in the world to furnish rooms with the best, at moderate cost.

Living Room Furniture

The living room is the first room for which it will occur to the householder to plan for furniture. For the family at large the living room is a night room, but it is also a day room for women and children. Every piece of furniture should be selected with the mind intelligently aware of this.

Providing first for the women of the family, there should

be a cozy corner where one may settle down for little tasks after the early morning work is done. Sewing, darning, embroidering, and all hand-work may be done in the living room, as well as the clerical work of the house, so you will see it must be for work as well as play. It should be just the sort of cheerful, cozy, sunny, restful room you would be glad to go to whenever the occasion arises.

Let the furniture be bought with these ideas in view. Choose refined, sturdy, comfortable pieces instead of ornate, flimsy, vulgar ones. Start with the living room table and plan around that the various other pieces. Have each piece clear in your mind before you buy: its function and location in the room.

A table 30″ x 42″ is large enough for a small family and from that size up to 42″ x 60″ will be found practical when placed where it will be a little island for readers and workers. Such a table with a lamp in the center will accommodate three or four readers. Underneath have a shelf for magazines and books.

In some rooms the living room table is well placed with one end against a wall. Determine the location by the purely utilitarian fact of greatest convenience. Across a corner is the least desirable place. Furniture rectangular in shape, like tables, pianos, settees, or benches, usually looks best when placed with one side parallel to the wall of the room. Rugs are usually better the same way, not scattered diagonally hit or miss over the floor. Chairs may be placed promiscuously, but other pieces should be arranged in an orderly manner. Books neatly stacked upon the table with bindings all the same way and parallel with the table edge look strikingly attractive. Never pile them up criss-cross with edges turned in different directions.

If you will experiment with your living room and arrange it once in the manner suggested, you will never change

back to the old helter-skelter method. Place a round table anywhere in the room. Round tables are not quite so convenient for reading, however, as rectangular ones.

The sectional bookcase was possibly suggested to its inventor by a child's building blocks. No more useful idea has been contributed to modern housekeeping. Almost every family starts with comparatively few books, desiring to complete the library from time to time as funds and inclinations permit, hence the sectional bookcase which grows with the library.

Unfortunately, it is rather difficult to get sectional bookcases of attractive design. Most of them are just little boxes piled one on top of the other with glass doors in front and there is nothing architectural or decorative about them. Some manufacturers, however, have given the matter special study and their designers have turned out patterns that approximate the decorative value of good, architectural "built-in" bookcases.

To those who prefer an ordinary bookcase there need be no difficulty in selecting a good, simple design. Glass or wood-paneled doors keep out dust and help to preserve the books, but many decorators think a bookcase is more artistic without doors. Any refined, simple design is best for the living room and a case with capacity for about one hundred volumes is a good size to start with. It is advisable to allot space for tall books at the bottom with small books at the top.

Have a settee or davenport, as it is a useful piece for the living room. It serves for a couch and is equally desirable for seating. Such a large piece of furniture must be carefully planned for, though it need not be placed against a wall; out in the floor in front of the fireplace is a good location for it. Choose a dignified pattern and above all a comfortable one. If your living room is small, do not pick out a davenport of the largest size.

There should be one or more comfortable easy chairs, at least one of the "wing back" variety. Nothing but structural comfort should be the rule and you will have furniture that every member of the family will respect. There are many good materials for covering the cushions of an easy chair. Spanish leather in shades of brown, green, or grey wears well and looks well, and tapestry, cotton and silk velour of medium weight comes in many pretty patterns suitable for chair cushions. Cushions should have as few buttons as possible. Plain cushions of simple material without button crevices to harbor dirt are probably best.

The most comfortable chair for women is a rocker with a broad, low seat. For short folk a cushion in the back of the chair will throw the body forward so the feet will touch the floor. Tall folk sit farther back without a back cushion.

Its balance is the most important thing about a successful rocker. The center of gravity should be far enough back at the end of the seat so that when the chair stands alone the seat will be at a slight inclination from the level of the floor. If the seat is parallel with the floor discard such a model as the tendency when sitting will be to slide forward. In a really comfortable rocker one slides down toward the back.

Every living room should have several side-chairs for general use and they may be as attractive as any others. It doesn't cost any more to have good-looking, easy side-chairs than ugly, uncomfortable ones. Side chairs should be smaller than ordinary ones and part ought to be rockers and part straight-back chairs. Chairs with rush or wicker seats are always practical and in appearance they are very attractive; also chairs covered with the pretty figured damask now used so much.

Most frequently the piano stands in the living room

and a music cabinet is required. Let it be of the same dignified, practical pattern as the other pieces. The most useful style is a cabinet with adjustable shelves, for you may arrange the distance between them to suit yourself. Some musicians prefer to file music vertically instead of horizontally, making it possible to get at any sheet or volume without lifting a copy above. Sketch the method you prefer, send it to any manufacturer, and he will procure for you the arrangement of pigeon holes best suited to your use.

There is often some spot in the living room where a screen would be desirable. Do not buy a screen merely for decoration, but use it for what it is intended—to protect you from a draught or conceal the work basket or some other prosaic article which must stand in the living room. You may buy a screen and have it covered as you like or do the work yourself. Leather is an excellent material to use, or heavy monk's cloth or burlap. If you choose leather select that tanned in soft brown, green, or copper shades.

When cloth is used decorate it with little stencil designs, using dyes or stencil inks. A design of straight lines or little square and round spots is more dignified for a living room than more complicated floral patterns. If the cloth is of light buff or natural-color burlap stenciled in soft, pastel shades of green, brown, red, or blue, the effect will be charming.

After deciding upon what pieces are needed give some thought to their color, as many a fine design has been ruined by lack of taste in color. Light, fumed finishes are always attractive for oak, as this process seems to bring out the grain and it takes on a beautiful, soft half-tone. A deeper shade of brown is attractive, also. Probably the least pleasing of all are dark brown, blackish and greenish finishes. These colors are apt to appear gloomy,

whereas lighter finishes give a cheerful cast to the room. Mahogany is always pleasing for furniture.

Most living room furniture should be dull finish. It is often better to have each piece the same color and if the trim can be finished to match, the utmost in beautiful effect is obtained.

Den Furniture

If there is a little sitting room or den in the bungalow it may be furnished more simply than the living room and prove one of the most useful and interesting rooms. It is here one may sit when the young people are noisy in the big living room, and quietly scan the evening paper or lose oneself in the charm of a restful book.

Choose the least attractive and quietest corner of the bungalow for the den. As it is really nothing more than an evening room, why give it undue prominence? With the exception of Sunday, the hours passed in the den are chiefly after sundown so it is not customary in planning the bungalow to allot any measure of precious, sunny location to it. It is more often to be found on the north side of the building, and wisely so.

The den need not be a large room; in fact, it is preferably a small one—a sort of cozy corner to tuck oneself into at the end of the day's work. One fair sized table, a bookcase or two, and three or four chairs are sufficient to furnish it.

The floor ought to be of hard wood and bare, with the exception of a few rugs. The furnishings should be few and extremely mild in design. You have probably seen a den treated otherwise, perhaps with a jumble of all sorts of furniture in every style: bric-a-brac from France, a Turkish cozy-corner, Japanese lanterns, and Chinese tables. But the ideal den is a place to rest, and a place of rest is

necessarily simple, without profuse ornamentation to tantalize one's brain; everything cool, subdued, and refreshing —that's as a den should be.

If the room is on the north side of the house it will be permissible to use a little orange yellow in the cream of the ceiling to give the room a slightly warm tone—a sort of artificial sunlight. A small fireplace will be attractive of a winter's evening. Very dainty, light green tile will be pleasing for the face of it with a dull green, dull red, or dull blue vase on the mantel to give a slight accent of stronger color.

Soft tans and ecrus are good colors for the den window draperies, which are better when they extend only to the window sill. The woodwork is frequently of oak, light in tone with the least dash of green in the stain to compensate for a sunless north room.

A small oblong table is a good model for a den, with two useful shelves for books or magazines underneath, besides a drawer for cards and other games. The table may be placed with one end against the wall, in which case it will accommodate three readers, or it may be placed out in the floor and provide space for four readers.

There should be a moderate-sized easy chair, and, of course, the Lady of the House will have her own, pet rocker, preferably a wide, deep-seated, low model with arms. The back should have just the right angle for comfort and the rockers should be broad on the foot, to do the least injury to floor or rugs, with a leather, loose cushion for the seat. This loose-cushion idea is vastly superior to old-fashioned upholstery. Imagine how much more sanitary an easily cleaned loose cushion is than a stuffed, attached cushion.

It will be well to have an ordinary rocking chair in the den, if space permits. The armless rocker is especially good for sewing, as chair-arms interfere somewhat with some

kinds of needle work. For those who wish to do so a comfortable cushion can be made for any chair out of leather, canvas, or velour. You may often pick up bargains in small pieces at the stores. The cushions may be stuffed with felt such as is now used so largely in mattresses. If another chair is needed for the den provide a straight back chair to match your ordinary rocker.

The bookcase should be made for duty, not appearance; with books on the shelves it will be attractive enough. On such a cabinet it is a good idea to hang curtains supported on a brass rod. Raw silk, linen, coarse homespun, or other like materials are nice for curtains. They are inexpensive and practical and come in all the pretty shades of green, brown, tan, and dull red. It would be in excellent taste to have these curtains the same tone as the tile in the mantel. Curtains for the bookcase should not be supported by a rod passed through the hem. They should be hung with brass rings so as to slide on the rod as easily as possible.

Dining Room Furniture

Somehow, when most people select furniture for a dining room they pick out heavy pieces. It seems to them that a successful dining room demands huge table-legs and chairs of clumsy pattern. Numberless bungalow owners have made this mistake and furnished the dining room with machine-made imitations of heavy foreign hand-made furniture.

The furniture in the dining room of a small bungalow may be heavy enough to do the work required but it must be simple and graceful in appearance. Eschew pieces of large dimensions and broad, squatty members. Select each item for the room carefully, having in mind the ensemble.

Modern English lines are appropriate for dining room

furniture. Chairs and tables with plain square legs slightly tapering toward the foot are excellent, with a buffet with a little woodwork above the broad top, and plain drawers and lockers below. Oak, walnut, and mahogany are excellent woods for dining room furniture.

Many of the most attractive of these modern dining rooms have low paneled dados in wood with beams on the ceiling to match. The walls above the panels are finished in rough sand plaster or covered with burlap, leather-board, or similar wall covering. Between the beams, above, the ceilings have a rough sand finish. When the walls are of plaster they are frequently tinted in soft colors like tan, grey, faded-green, or golden brown. Ceilings of cream, yellow, or lighter shades of the wall colors are good. These are much more attractive than the stronger colors such as red, strong-green, and deep brown, so often injudiciously used.

Burlap of the natural color is excellent for the wall space above a paneled dado of oak. It looks well with either light or dark trim and forms a perfect neutral background, giving a conventional tone to a dining room.

A plate rail is not so much used as formerly. The tendency is to display only a few of the choicest bits of china in a small china cabinet or on the buffet and serving table, keeping the stock in the pantry or serving room. One's dining room must not look like a china shop, and the labor of dusting china openly displayed in a dining room is great.

A 42-inch round extension dining-table when closed will accommodate comfortably four people. With such a table ten or twelve people can be served when it is extended. This is about the maximum requirement of a table for a bungalow.

It is agreeable to see in the designs of the best furniture manufacturers a tendency to conserve and simplify. A few years ago all the sideboards and buffets were elab-

orate affairs with countless lockers and drawers, the former hung with fancy doors, glazed with glass of every hue. Now utility and durability seem to be the prime points.

One never tires of a plain piece of furniture even when it is so simple as to be stupid. Go a step beyond and use simple furniture that has the grace of good outline and correct proportions. Nothing in the furniture line can better the charm of such a piece.

A buffet should be as plain as may be without becoming affectedly so. With two drawers for silver above and two fair-sized lockers below, there will be sufficient storage capacity for the needs of a family of ordinary size.

No family is so small that it cannot appreciate a serving table and find it a most useful article of furniture for the dining room. It relieves the strain put upon the buffet, besides offering a convenient counter from which to serve side-dishes or entrees. Fruit is frequently served from the serving table, and it is useful for the flower-bowl or water pitcher and glasses.

Dining-chairs usually have straighter backs than ordinary chairs, as it has been found that straight backed chairs are the most comfortable at the table. The backs should not be too high, or great difficulty will be experienced in trying to serve over an impenetrable wall of chair-backs.

Chairs should be selected to be well balanced in weight so that they are easily pushed back and forth, a quality quite necessary in a well designed dining-chair.

Bedroom Furniture

No room in the house, perhaps, can be so inconvenient as a bedroom when it is poorly arranged. That is why most architects show the arrangement of bedroom furniture on their plans and are careful about the location of windows and doors, in order to provide sufficient wall space.

There are so many styles of dressers in the market, one will have no difficulty in finding a piece adaptable to any bedroom. There are all sizes, in all degrees of elaboration and in many colors. A dresser built along the most simple lines is usually the most satisfactory. If you wish to use the dresser as a toilet table choose a low piece, before which one may sit down and look into the mirror. The best patterns of dressers usually have the upper part in two drawers instead of one. This, with two or three drawers below, is the most convenient arrangement.

A chiffonier is truly a man's article of furniture, though it may also be extremely useful for a woman. Men like a high shelf and mirror in dressing and it is this demand chiefly which has produced the chiffonier as we know it in modern times. The toilet articles of the man are placed on top and some men have as many toilet "tools" as a woman. The first two drawers are usually for shirts, collars, cuffs, and ties and other little things in constant demand. In the drawers below are kept underwear and pajamas.

There is a bewildering variety of beds to choose from, of every possible description, with endless patterns for the head-board, foot-board, and legs. Colonial patterns are particularly light and graceful, suggesting the refined atmosphere of a good home. Simple turned legs are in excellent taste. Brass beds are always practicable.

For such beds one may use a spread of Colonial type. Chintzes and similar materials in bright floral designs are best.

The bedroom writing desk may be small and simple but it will, nevertheless, prove one of the essentials of a well arranged room. The convenience of writing material in one's own room for use at any hour is undoubted. The top of the desk should be covered with a plain white blotter tacked to the top with thumb-tacks, or a blotter pad

with leather corners. An inkstand with ink wells of very plain blown or cut glass is best. Every bedroom should have at least one rocker. Chairs should be light and strong without sacrifice of comfort and appearance.

When the bedroom is large enough, it is excellent practice to furnish is as a combination bedroom and sitting room. The bed or beds can be placed at one end of the room and at the other end one may have a comfortable reading table with an easy chair or two. A very useful and ornamental piece of furniture copied from European models is known as a "chaise longue," and is, in fact, a little sofa of special design. It has come to be especially desirable for bedrooms and proves useful for napping as well as lounging.

Whether twin beds or double beds are preferred is entirely a matter of opinion. Popular opinion seems to incline toward twin beds. It has been found from practice that a pair of ordinary twin beds each of which is 3 feet 6 inches wide takes up too much wall space for a bungalow bedroom and the 3-feet-wide variety is quite as comfortable. It has been the author's experience that one can sleep as luxuriously on a 3-foot mattress as on a wider one, so that considerable valuable space can be saved in this manner.

At the bedside, or between the twin beds when the latter are used, put a little table to hold a lamp and the telephone (when there is one). It will prove a handy place for a book or two and the cool water bottle, as well.

There are many clever cabinets for storing gowns and other clothing in the bedroom. The "chifforobe" is a combination of the chiffonier and wardrobe found very useful in any bedroom; then there are various patterns of chests, cedar and otherwise, in which clothing can be packed away and which offer the further advantage of providing a comfortable seat or settee as well.

In color the bedroom furniture may follow the tone of the woodwork. If the bedroom trim is painted white, hardwood furniture extremely light in tone will harmonize. Avoid deep or dark colors in bedroom furniture. Choose rather, cool, light, dainty colors.

CHAPTER 19

A PLEA FOR GARDENING AND LANDSCAPING

NO book on the bungalow would be complete without some consideration of a very important point when building—the arrangement of the grounds. There is something more than the botanical side of planting for home grounds; something more than color, period of bloom, and height of flowers in the garden.

To start with, every bungalow requires a setting, and no setting can be right unless it is studied architecturally. The style of building and characteristics of site must be carefully considered, so that a comprehensive scheme for the entire grounds can be worked out intelligently. Once your planting plans are made, you may work to them for years after, doing a little each season until the scheme is complete. This is a very much better way than the ordinary hit-or-miss planting where one does a little planting here one season and a little more there, next, with no very consistent idea of the outcome of the planting as a whole.

At the beginning of planning a bungalow one cannot, of course, develop a very comprehensive scheme for architectural landscape. It is only after the building has been built and its effect studied from every angle that the problem of arrangement of the grounds can be fully appreciated, but right at the start before ground is broken for the cellar, even a general idea of after-planting should be well fixed in mind.

For instance, how can the architect or owner correctly plan the building unless familiar with the building site, with at least an approximate idea of how the buildings should be located on the lot, including the approaches, entrance, drives, fences, and gates? When building operations are actually begun it is impossible to locate the bungalow to best advantage, unless some idea of future planting is borne in mind.

Time to consult a landscape architect or gardener is before building operations are started. Of course, any expert may study an existing house and plant the grounds skillfully, but how much better if he has had an opportunity to advise before the house is actually begun. Then, he may formulate a scheme whereby bungalow and surroundings will be a complete unit with all the buildings set to become part of a single, comprehensive plan. This is the way our English cousins handle their problem and in no country in the world is architectural landscaping better understood.

What is meant by the term "*architectural landscaping*"? One must understand that *gardening* and *architectural landscaping* are not the same thing. By the term *garden*, it is to be presumed, we mean merely a decorative floral detail, one portion of the complete plan embraced under the term *architectural landscape*. In other words, the garden is merely one page, or a single chapter, of which there are many contained in the volume called "architectural landscape."

Just as an author must have a general conception of his entire plot before he writes the first page, so should the house owner have a plan for his architectural landscape before he considers a single flower, shrub, or tree. Most landscape architects make the preliminary study of their problems by considering general requirements, broadly. Before giving thought to this shrub or that flower they con-

sider a location for the house, where its approaches (walks and drives) could be laid out to best advantage.

Naturally this preliminary study also involves grades and drainage, for it must be determined right on the start whether the house is to stand high or low; whether abrupt banks and terraces should be built or long sloping lawns with unbroken surfaces. If terracing is to be resorted to, steps and retaining walls must be considered. Driveways and walks must also receive attention at this time. This is all matter requiring an expert, though the owner, of course, by study may be his own "expert."

The next step is to consider the landscape as it will appear from inside the bungalow, for one must remember that it is not sufficient to plant the home grounds for exterior beauty alone. Views from windows of the house must be considered. Uninteresting or annoying buildings next door should be screened. Good vistas from the living room windows must be planned to make the home more enjoyable.

Then, after a time, one begins to think of actual planting details. *This* kind of a shrub which will prove hardy in a shady spot and *that* kind of bloom to furnish flowers during the hot, dry days of July. But these details should not be studied until after the general scheme is planned.

Of course, all bungalow owners do not go at the problem in this way. Many just proceed to build, leaving details of landscape work to be taken care of after the building is finished. Those who have tried the other way, however, find it possible to get more successful results. In almost every case when you view a house well set in the midst of grounds charmingly laid out you may be sure the architectural landscape and the house were planned together.

Many practical ways for considering the architectural landscaping of a place will occur to everyone. One can always consult a gardener or landscape architect. Prac-

tically all large dealers in shrubbery and trees employ one or more landscape architects for the convenience of their customers. Many times this service is furnished gratis; in other instances a fee is charged for the complete landscape plan. For large estates (or small ones, either, for that matter) one can consult an independent landscape architect who will visit your building site and draw plans and specifications fitted to your needs. Having a sketch plan of the building site furnished by the owner, experts can give good advice by mail.

Some house architects include with their service the designing of the landscape work surrounding the house. Others work with a landscape architect so that house plans and landscape plans can be developed in close harmony.

Almost every reader is familiar with the general adjuncts required in modern landscape architecture. There are walks and drives made of cement, brick, stone, tile, or gravel with fences, posts, and walls, all of which can be made very decorative when employed skillfully. Then there are various styles of terrace—high terraces and low terraces with cement or stone steps and balustrades which help so much to set a bungalow off and give it a good architectural base to stand upon. Pergolas, summer houses, garage, tool house, sheds, greenhouse, lattices—all can be and should be considered in the original scheme.

Take, for instance, the garage. Naturally this building may be located anywhere on the lot at about equal cost, it making no difference whether it is placed north, south, east, or west. Yet what a difference it makes in the landscape treatment of the home grounds when a garage is located at the termination of a pretty vista, or, perhaps when connected to the house by means of a charming pergola or simple lattice fence.

Summer houses cost about the same in any location, but they greatly enhance the effect of an architectural scheme

when located at some important spot like the center of the garden, or when two of them are placed one in each corner by the garden wall.

At least one fountain should be set at some focal point in the garden. Simple, inexpensive pools of cement make beauty spots of great value in the landscape. Low cement boundary walls at the edge of a driveway or beside a terrace also give snap and life to the architectural appearance of the grounds, at slight cost.

Many go in for Japanese gardening with quaint landscape effects in miniature and when sympathetically handled the Japanese garden is most charming and costs very little. One can often pick up stone, cement, and clay lanterns or garden furniture suitable for Japanese gardens at very reasonable prices, treasures that will prove of lasting value as garden ornaments.

Cement, clay, and metal garden urns may be had in infinite variety of pleasing forms. Nothing adds more directly to architectural gardening than pieces of this sort. Garden seats and tables made of cement or stone are attractive and should be employed in the scheme by all means. Bird pools and sun dials are of course desirable and do not involve a great expenditure.

As already stated, of first consideration is the landscape scheme itself. Start with a complete idea sketched out on paper, showing floor plans of house, garage, sheds, and other buildings. Lay out drives and walks. Plan lawns and terraces. Locate shrubbery and trees. Select the best spot for the flower garden and another good place for the vegetable garden. Indicate walls and steps where they will be useful and effective. Consider seats, pools, and other garden furniture.

All this, it will be readily appreciated, involves a great amount of study, considerable patience and not a little skill, but it is work that proves intensely interesting. It is labor

that brings returns year after year as long as your place stands. One year, two years, or five years after your bungalow is built, the various clever units of your complete architectural landscape plan will begin to evolve and your grounds will soon prove a joy to yourself and to your neighbors. With a comprehensive plan to start with, one may proceed with the details of planting quickly or slowly. You can put in so much shrubbery this year and a little more next year. You may purchase full grown trees for immediate effect or small ones to reach maturity ten years hence, and in each case know that your planting will be right.

No bungalow, however beautiful, can be a success unless it has tastefully planted grounds. Every bungalow, no matter how ugly, can be greatly improved by clever landscape work. It makes no difference whether a building is located on fifty feet or five hundred—the skillful architectural landscape can render it harmonious, attractive, and in good taste. Size of grounds doesn't count. Arrangement of grounds counts—counts so much that many beautiful houses are made distasteful by unsympathetic consideration of surrounding planting.

With so many opportunities for education along these lines, surely it is unpardonable, now, for any house owner to have grounds unskillfully planned. It is to be hoped that the time is approaching when landscape mistakes will cease and every home-place will be a credit and joy to the community.

In New England, house builders of a hundred years ago knew a great deal about architectural planting. Whatever they planted, no matter how simple, was effective and stood the test of time so well that their methods have become basic for much of the modern planting. Most old-fashioned gardens were laid out architecturally in parallelograms and whether the garden was in front of the house or

(as was most often the case, at the side or in the rear) the planting seems to fit the building. There is harmony between building and grounds just as there is in the beautiful gardens of England.

Of course, some building sites are so endowed by nature with trees already grown the planting scheme becomes insignificant. However, few building sites offer perfect natural advantages. Most places require to be coaxed and petted along after the building is completed to give the house a proper architectural setting.

In order to solve the problem accurately and avoid risk of planting what may have to be moved later, every shrub, root, tree, or flower should be first laid out on paper. With a plan of this sort it is surprising how quickly one grasps a planting scheme and how easy it is to develop a planting plan intelligently.

When it comes to the materials of which walks may be built there is an opportunity to use judgment. Cement makes an excellent wearing surface but cement should not be used for walks which are too far away from the house (unless it be as a foundation for a brick walk). Brick walks look well everywhere, but they are not practical unless there is a firm, well-built concrete foundation under the brick. Old-fashioned brick walks laid in sand are not practical for modern places. Something that will stay after it is laid is now required, and brick laid in sand soon gets out of level after successive thawing and freezing during winter.

To build a brick walk properly, trench out the ground to a depth of 18 inches or more. In the bottom of the trench lay about 8 inches of cinders topped with 4 or 5 inches of good cement concrete. Then on this firm foundation (when it has hardened) lay your brick in a 2-inch bed of sand just as close together as they can be laid. After they are put in place and pounded down with a heavy tamper, pour

cement, sand, and water (mixed to about the consistency of milk) into all the cracks and when the cement has hardened clean off the top of the walk with wire brushes and acid.

Paving brick are best for walks, especially those pavers which are dark red in color, with rounded edges. Square brick are apt to crumble on the edge and do not wear so well. Most pavers are set on edge, with joints broken precisely the way they are in a brick wall.

Cement driveways are very practical for automobiles but unless the driveway is placed, either close to the building or entirely away from it (as at one of the boundaries of the property), a cement driveway does not make a pleasing appearance, streaking across the lawn. Thus, the driveway should be carefully planned as to location, so that it will not take away from that expanse of lawn which is so much desired by landscape architects.

Crushed stone makes a good driveway though it must be kept in repair, for automobiles soon wear ruts in it. Cinders also make a very good driveway when packed down hard, though such require a little work done on them every year to keep them in condition. Both crushed stone and cinders need a good, firm foundation of heavy broken stone—old brickbats or anything else of like nature that will make a sound foundation.

A few simple architectural features at strategic points about the grounds will do much to enhance the beauty of the place. Simple brick piers with flower pots, or a little concrete pool, or a few cement garden seats or a sun dial always produce a result surprisingly attractive at little cost.

Concrete vases on top of gate posts when filled with flowers usually look well. Even plain wooden flower boxes have their function, giving an architectural result difficult to get in any other way. These are the features that pay. They give your grounds that individuality so necessary to

a successful planting scheme. They are the architectural attachments that help make the grounds harmonize with the building.

Especially when the bungalow is of brick, iron fences in connection with brick piers do much, architecturally, for the home grounds. In other places, hedges arranged architecturally and kept carefully trimmed are the right thing. Often there are no boundaries at all but merely a straight or gently sloping lawn extending down to a border of hardy perennials.

Trees are, of course, necessary to the architectural appearance of any place, to say nothing of the comfort afforded by them. However difficult it may be to get them and whatever they cost, you must have trees not only for comfort and decorative effect in summer, but for the architectural effect they give in winter, also, with their branches in silhouette against the sky.

The most practical trees to use are nursery trees, for these have been moved many times from place to place on the nursery grounds to prepare them for their final move to your property. Thus, they have the "moving habit" and will prove more hardy, usually, than trees from the woods which have never been moved.

It is surprising what large trees can be moved successfully. A good way to accomplish the moving of a large tree is to dig a trench around it in the fall before frost, making the excavation well outside the area of roots and then leaving the tree until the ground freezes. In the meantime, a hole can be dug to receive it at the new location. Once the ground is thoroughly frozen, so that the earth containing the roots of the tree is frozen into a solid ball, it is easy to move the tree without injuring the tender tendrils so necessary to remain undisturbed.

The back yard is a place most frequently wasted in American grounds. In England the back yard is a front

yard; in America most frequently, it is not. Unfortunately some house owners use it as a sort of dump for ashes: a neglected place hidden from public view, where neatness is not always the chief end. Folk who use their back yard as a back yard make a great mistake. They have acquired something that is not giving them the greatest return for the money invested. Improve the space back of your bungalow until it is as pretty as in front. You may have your entrance and kitchen on the side next the street, fronting the living rooms on the reclaimed back yard, or you may have the kitchen on the back with the living room extending through to take advantage of a pretty view. In any event, the space back of the house should be treated as a garden and lawn, not like a back yard as ordinarily understood. Plant shrubs and set out trees. Lay out a tennis court and croquet ground. Make the space beautiful and useful. Cause it to yield of its best for the benefit of the family, just as much as the front yard.

You may not care to have your kitchen on the street side of the house, but that is no reason why you should have an unattractive outlook from the rear windows. There is nothing impracticable about improving a back yard. No great expense is involved in laying out lawns and paths and decorating with flowers and shrubs. Treated in this way the back yard will become the best loved feature of the entire place.

CHAPTER 20

THE BUNGALOW GARAGE

THE garage has come to be quite as much a part of the requirements of a home as a cellar, the porch, or the kitchen. Even those householders who have not yet achieved that desirable ideal, an automobile, plan for the acquisition of one, later, so some consideration should be given to the housing of a car at the time one builds.

At what place in the yard should the garage be built? Is it best to have a garage attached to the house or should it be built as a separate unit? These and other questions arise and demand intelligent consideration. Garages of the vintage of 1910 are almost as much behind the times as 1910 automobiles, for along with developments in automobile design and construction have come new ideas for the garage.

Automobiles at first were adaptations of carriages with the horse left out; the first garages were copied after the stable, a building which quite naturally followed very different ideas as to arrangement than the modern garage. Designers quickly found that the automobile could not be conveniently stored in a stable. With no space required for horses, harnesses, and feed, the old stable type became obsolete and designers began to experiment on buildings for strictly garage purposes.

The first garages built were often too large or too small, rarely of just the right size. Usually they were equipped with a pit over which a car could be backed for repairs un-

derneath. This pit was a necessity in those days when repairs were frequent, and chauffeurs spent much of the time beneath their cars. With modern apparatus extensive repairs are less frequent, and pits are no longer required except in public garages. For extensive repairs most owners take their cars to a repair shop.

To start at the beginning of the garage problem, let us examine a few types of "portable" garages which can be bought "knocked down." These are cheap, practical, and may be reasonably attractive architecturally. For the man who wants to keep his garage cost down as low as possible they can be recommended. Another advantage is that they can be obtained quickly, as most manufacturers carry the various styles and sizes in stock ready to ship promptly. Each little building comes in convenient sections ready for assembling and bolting together at the building site and the owner is required to furnish nothing but the foundation.

For the foundations of portable garages as well as garages of ordinary type, cement concrete is probably the most used material. Since no basement is usually required, all that is necessary is to dig a trench 8 or 10 inches wide and about 3′ 6″ deep and fill it full of concrete up to the ground level (or a few inches above). The framework of the building is set on this. Since the average garage is rather light in weight, it is a good idea to sink bolts into the cement foundation, allowing them to project enough for bolting the sills, later, when the framework of the building is completed.

A cheap way to support a light garage is to set the building right on a concrete floor previously constructed, in which case no further foundations are required. To do this the soft top soil at the spot where the building is to stand is dug away (usually to a depth of about 8 inches). Then the space is filled with cinders, upon which a concrete floor about 5 or 6 inches thick is built (like a sidewalk).

With bolts left sticking up around the edge of this floor, the framework of the building can be bolted down and you have a garage standing on a cement platform, which is very convenient construction.

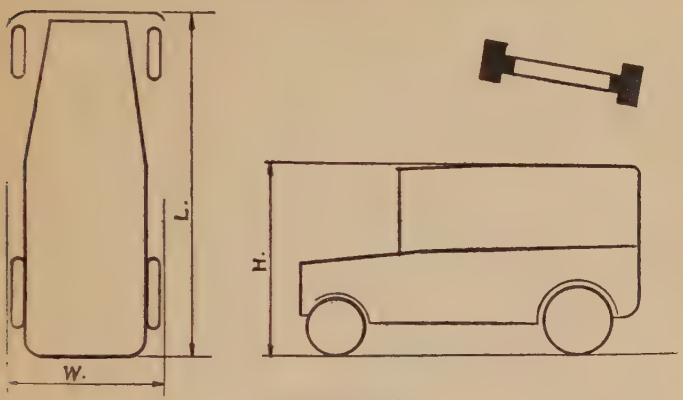


FIGURE XXI.

TABLE OF AUTOMOBILE SIZES.

Kind	*Length* (*L*)	*Width* (*W*)	*Height* (*H*)
Small Electric	10′ 7″	5′ 6 ″	7′ 2 ″
Large Electric	13′ 0″	5′ 8 ″	7′ 2 ″
Small Four Cylinder	12′ 5″	5′ 6 ″	6′ 8 ″
Large Four Cylinder	14′ 10″	5′ 8 ″	7′ 0 ″
Small Six Cylinder	14′ 1″	5′ 8½″	6′ 9 ″
Large Six Cylinder	15′ 10″	5′ 8 ″	6′ 10½″
Ordinary Eight Cylinder	15′ 5″	5′ 8 ″	6′ 10½″
Twin Six	16′ 5″	5′ 8⅛″	7′ 0 ″

Before beginning work on the plans of the building the designer, of course, must know something about the number of cars it is desired to house there, and their size. Years of experience in garage design have developed some ideas on the best working size for such buildings, including the proper width and height for doors, length and width of each "stall" (as the storage space required for a car is

called), amount of space for the work bench, gas pump, sink, wash rack, and so on.

A glance at the diagram illustrated will show the over-all dimensions of three general types of cars: the large 7-passenger limousine or sedan, the medium-size roadster or 5-passenger touring car, and the ordinary electric car. These are the three types of cars generally used. Of course, when a medium sized "four" is the car to be housed (instead of a "six") the space required is smaller and can be determined by measuring the size of the car (width from out to out of mud guards and length over-all from lamps or bumper to end of lowered top). Most owners, however, prefer to allow space enough for a large car, even though their present car may be a small one, as one never knows when he may purchase a larger car and require space for it.

The best practical minimum size for the large automobile doorways is 8 feet wide and 8 feet high. As will be seen upon reference to the diagram showing sizes of cars, these dimensions are more liberal than strictly necessary; however, it is best to allow plenty of room. As a matter of fact, in many garages the doors are made 9 feet wide and 8 feet 6 inches high.

In driving straight into a garage less room is required in the doorway than when an angle-turn is made to get into the building. For instance, the garage is often located next to an alley, and to drive into the building it is necessary to swing sharply at right angles from the alley. Thus, the automobile as it passes through the doorway is somewhat on an angle, as there is not sufficient distance to "straighten out" in. In a space of this kind it is usually best to have an extra wide doorway. When space for two cars is wanted in such a garage, omit the center post between the two sets of doors, so that with all the doors open you will have ample room in which to maneuver.

Really, the entrance of a garage (location and size) is of great importance. The idea should always be to provide a doorway large enough to permit cars to be driven in without inconvenient maneuvering. Backing and twisting to get into proper position in a stall is a great annoyance, and

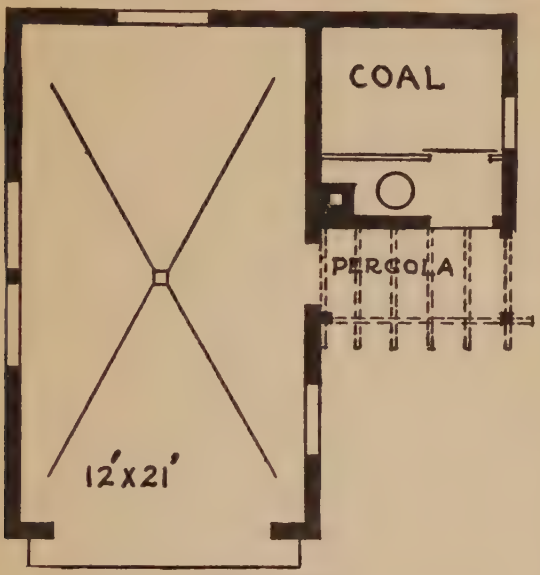


FIGURE XXII.
FLOOR PLAN OF A SMALL SINGLE-CAR GARAGE.

the garage should be designed so that one can drive straight in or swing directly into the stall in one drive. In a garage in which there is a right-angle drive it is very useful to have an iron track in which to run the car, or guide strips may be painted on the floor. Thus, in entering, the driver always has a track to follow and must of necessity swing his car properly when following the tracks. These

tracks are similar to those often used in Fire Department buildings.

One of the most practical ways to get at the amount of space required in a garage, with the proper size for doors, is to make a little paper pattern representing the size of each car. This can then be maneuvered on the floor plan of the building to see if the car will enter the stall without interference. For instance, if your floor plans are drawn to "quarter-inch scale" as most of them are, sketch out an oblong on paper (also at quarter-inch scale) as long as the entire length of the car and as wide as its total width. Then push this little paper pattern over the floor plan. Push it through the doorway and see if there is plenty of room.

The design of garage doors should receive careful attention, for no detail of the building will be found more annoying when the wrong kind of doors are installed. Doors that stick or bind are a great nuisance; also doors that are fitted too loosely, permitting cold winds to penetrate the building.

There are a great many methods of hanging doors. Some prefer ordinary sliding doors (like old-fashioned barn doors) and there are many track hangers made for this purpose much superior to old-fashioned track hangers. In this case what one wants is overhead tracks with good, strong, easy-rolling wheels, so that the doors will slide easily. Most sliding doors are hung inside the building. To prevent them from swinging inward at the bottom when a strong wind is blowing, a guiding pulley should be provided in the floor; another method is to provide a slot in the floor in which a metal arm, fastened to the bottom of the door, slides.

For fastening large garage doors there are many kinds of hardware made specially for the purpose. Some designers recommend an ordinary hasp and flat-key padlock, in which case the hasp is fastened to the door by means of

bolts impossible to remove from outside. Others use a mortise or rim cylinder lock. In many garages the large doors are bolted or hooked and entrance to the building is first gained by unlocking the small entrance door, after which the large doors are unfastened from inside.

Swinging doors are used frequently in garages and they may open inside or outside. In the former case, of course, the garage must be deep enough to provide room for the cars plus the space occupied by the inward-opening doors. When doors open out it is a good plan to have a little post built into the cement runway outside, on to which the doors can be hooked when open.

Four-fold swinging doors are excellent and will be found desirable in many cases. These consist of four doors to each opening, the right and left-hand doors being hinged to the door jambs and the extra pair of doors in the center hinged to the right and left doors. This can be accomplished by using special heavy T or strap hinges for the right and left doors, capable of holding the weight of the four doors. To take this tension from the supporting doors, however, one may obtain garage door sets with an overhead track from which the doors are hung by means of grooved pulleys. This is an excellent way to hang doors as all sagging or binding is eliminated. Ordinary doors may be swung in pairs on heavy hinges.

Advantages claimed for doors opening outwardly are that they take up no room inside the building when standing open, and that they are more easily made tight at the floor and sides. On the other hand, it is claimed for inwardly swung doors that they are more conveniently handled when snow is on the ground, because it is not necessary to shovel away the snow from the threshold in order to open the doors. Both methods are successful when the doors are built properly and the right kind of hardware is employed.

One ideal type of garage contains two sets of doors, one at the front and the other in the rear. Thus the car is driven in one door and out the other and it is unnecessary to turn around or back up to get out. Another good way to get over the "back-up" proposition is to use a floor turn-table which permits one to enter and swing cars to any position required. Turn-tables are very convenient and they operate on their freely moving roller bearings so easily that a very slight effort will turn the heaviest car.

The garage attached directly to the bungalow is a great convenience and means a saving in first cost usually. Either a one or two-car garage can be planned to occupy a wing of the original bungalow and will be found convenient because it can be reached in stormy weather without going out of doors. At the same time it is readily heated from the house heating apparatus in the basement of the bungalow, the short length of pipe required contributing to fuel economy. Hot and cold water pipes are run with ease and the necessary sewer connection is right at hand.

Usually the attached garage extends from the kitchen or rear entrance. In a small bungalow there is no great objection to passing through the kitchen to reach the garage. In a more pretentious home, however, it is much more convenient to reach the garage by means of a rear entry or other passage not necessitating passing through the kitchen. One can readily understand that it might be unpleasant to take guests through the kitchen to get to the car, and even the family use of the kitchen as a passageway to the garage might be unpleasant and inconvenient. An attached garage should always be separated from the house, itself, by means of two doors with a little entry between. Otherwise the fumes of gasoline and other automobile odors are liable to penetrate the living rooms unpleasantly.

The wall which separates the garage from the bungalow should be fireproof and the door between the bungalow

and garage should be fireproof as well, for obvious reasons. This wall can be of hollow tile, brick, concrete blocks, solid concrete, or other similar material. In many cases it has been found practicable to build it of steel studding, covered both sides with metal lathing and plastering.

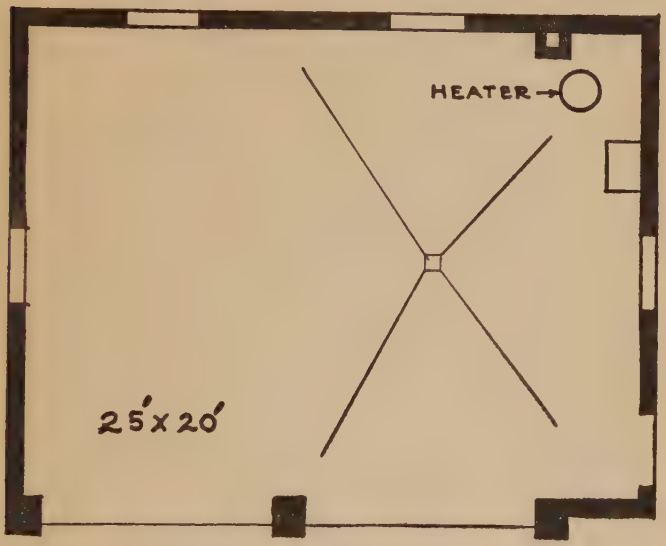


FIGURE XXIII.
FLOOR PLAN OF A TWO-CAR GARAGE.

The door in the wall through which one passes from the living rooms to the garage should be of steel, or a tin-clad wooden door may be used to advantage. That is, an ordinary wooden door may be covered with sheet iron, galvanized iron, or tin, to make it fire-safe both sides. Not only should the attached garage when of frame have the fireproof wall and door above mentioned, but it should also have a metal lath and plaster ceiling as well, other-

wise a fire starting in the garage might communicate itself to the balance of the structure by means of the ceiling.

Since the garage will be on the level of the ground and the floor of the bungalow, proper, will presumably be several feet above the ground, a few steps will be required from the floor level of the bungalow to the floor level of the garage. This is a distinct advantage in fire protection, because it is a well known fact that the fumes of gasoline do not rise but seek the lowest levels. Thus, when the garage floor is below the floor level of the bungalow, fumes are less apt to penetrate the house by seeping through the doorway than when both buildings are on the same level.

The semi-detached garage (placed a short distance away from the bungalow to which it is attached by means of a covered passageway or pergola) is also a practicable type and will be found convenient when not too far away. The short distance to walk from the living rooms will not be found inconvenient if the connecting link is sheltered, and the few extra feet of heating and plumbing pipes will not add excessively to the first cost of the installation nor prove uneconomical in operation.

Ten feet is a practicable distance to place the semi-detached garage from the building proper. When a pergola is used as a connection between the two buildings, it may be made architecturally attractive. A trellis can be employed with or without rows of posts or columns on both sides. The pergola should be roofed over or a very desirable feature will be lacking—that of providing a covered way from one building to the other in stormy weather. Often, this pergola can be used as an automobile hood under which one may park the car in inclement weather.

When a garage is attached directly to the house a second story (or half-story) can easily be obtained for servants' rooms. Thus, the garage makes a story-and-half wing on the building.

Many house owners have discovered that it costs but little more to build a two-car garage than one with space for but one car, and for this reason the two-car unit is very popular. Until the family fortunes make it possible to own two cars the extra "stall" will be useful for storing tools, screens, storm windows, automobile supplies, bicycles, the hose reel, and many other articles commonly kept in the basement. It is a great convenience to park the baby carriage, for instance, right on the ground level and not be obliged to haul it up and down steps.

The general requirements of any garage, whether it be attached, semi-detached, or entirely separate from the bungalow, are the same.

Usually a concrete floor is built, sloped slightly toward the center, at which point a drain is located. This drain should be large in size and contain a removable cover, so that the grease and dirt which come off the car can be removed if the drain clogs up. A very good idea is to have a small brick catch basin about two feet in diameter and two feet deep (with a perforated iron cover) in place of an ordinary floor drain. The catch basin connects with the sewer by means of a trapped fitting and the purpose of the brick basin is to catch grease and dirt before it enters the sewer. At any time the iron cover can be lifted and the catch basin cleaned of all debris. Drains on a garage floor cause a great deal of trouble unless they are very large. If dirt and grease are permitted to enter the sewer they will soon clog the pipes and necessitate repairs.

The level of the garage floor should always be at least four inches above the level of the yard, and this difference in level should be taken up by an inclined apron. When a floor is placed too low, melting snow or rain runs in under the doors. It is the custom of some garage designers to have the garage floor pitch slightly toward the doors so that in case of fire the cars could be pushed out quickly

without necessitating starting the motors. Of course, it is desirable to have a fire extinguisher hung in a conspicuous place in the garage.

In planning a garage one should leave sufficient space for the cars with a workable aisle on four sides of each car. A few feet more or less will not add greatly to the cost and may mean much in convenience. Few car owners care to

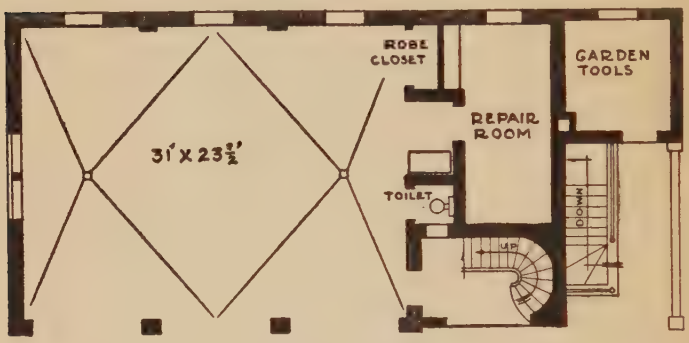


FIGURE XXIV.
FIRST FLOOR PLAN.
CHARLES E. WHITE, JR., Architect.
TWO-STORY GARAGE ACCOMMODATING THREE CARS; CHAUFFEUR'S QUARTERS ON SECOND FLOOR.

do any more than the ordinary repairs on their cars and for this reason, as has been said, few private garages are now equipped with pits for working underneath the car. It is a very good idea to eliminate the pit when possible, as it is a damp, greasy place in the garage floor which must be covered with an unwieldy wooden or metal cover, making an unsightly object in the floor.

In country districts where public greasing stations are not available, an elevated rack in the yard upon which the

car may be run can be employed instead of a pit. It may be used for repairs as well as greasing.

After years of experience in designing garages the general plan adopted by most designers consists of a rectangular room containing the required space for stalls. The size of the room is rigidly held down to the requirements of space for the cars plus workable space on all sides. A work bench is highly desirable in one corner where the light is good and there should be a cabinet for tools, with a lock on the door.

In the best practice a window or group of windows is placed at the end of each stall and usually these windows are placed at least four feet from the floor. Wall radiators or ordinary radiators are put at the back of the garage, so that when cars are driven in, the radiators of the latter will come close to the garage radiators. This keeps the cooling system of the cars warm, even when the garage itself is only moderate in temperature.

Many garages are not heated in winter and heat is not strictly necessary when a non-freezing mixture is used in the cars. A cold garage, however, is hard on the varnish of a car. Garage heating apparatus can be placed directly in the garage when it is not desired to heat the building from the house-heating plant. In this case a special garage heater should be employed, in which the fire of the heater is protected from gasoline fumes. Apparatus is made for this purpose and it is not necessary to place the boiler in a separate room. Some of the best of these heaters consist of a small hot water boiler with an expansion tank above. The boiler is connected to one or more wall radiators close to the boiler and with this apparatus the temperature of an ordinary garage can be maintained at 40 to 60 degrees (usually considered sufficient for a garage) with very economical fuel consumption.

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